







THE  
MISCELLANEOUS WORKS  
OF  
ADAM CLARKE, LL.D., F.A.S.

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VOL. IV

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STURM'S REFLECTIONS.  
VOL. II.

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LONDON :  
PRINTED FOR T. TEGG & SON, CHEAPSIDE ;  
R. GRIFFIN AND CO., GLASGOW ; T. T. AND H. TEGG, DUBLIN ;  
ALSO  
J. AND S. A. TEGG, SYDNEY AND HOBART TOWN.

MDCCCXXXVI.



LONDON :  
PRINTED BY J. HADDON, CASTLE STREET,  
FINSBURY.





*Corbould del.*

*Freeman sc.*

## STURMS REFLECTIONS.

*London. Published by Thomas Tegg & Son, 1836.*





REFLECTIONS  
ON THE  
BEING AND ATTRIBUTES OF GOD  
AND ON HIS WORKS,  
BOTH IN  
NATURE AND PROVIDENCE,  
*For every Day in the Year,*

ORIGINALLY COMPILED IN GERMAN,  
By CHRISTOPHER C. STURM.

CORRECTED, TRANSLATED, METHODIZED, AND GREATLY ENLARGED,  
BY ADAM CLARKE, LL.D. F.A.S., &c.

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IN TWO VOLUMES.  
VOL. II.

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# REFLECTIONS.

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JULY I.

A HYMN IN PRAISE OF THE AUTHOR OF NATURE.

How great art thou, O Lord, my God! The earth proclaims thy majesty, and the heavens are the throne of thy glory. Thou hast said, Let them be! and, at thy command, they were extended in the immensity of space.

The thunder causes thy praise to resound; and in formidable array thou walkest on the wings of the lightning! I perceive thee in the splendour of the sun; and see thee in the flowers which deck our fields.

Is there a God like unto our God? Who is it that walks on the winds? Who holds the thunder in his hands? Who commands the lightning to blaze through the forests?

It is thou, thou alone, O Lord! thousands of worlds glorify thee: thou hast given them their being; but at thy threatening they flee away—are annihilated, or assume a new form.

The whole creation is a Temple erected to thy glory. In it thou hearest thy praises celebrated; millions of celestial choirs adore thee with songs of thanksgiving.

All celebrate thy glory, from the seraph, who beholds thy face, to the most insignificant worm which crawls on the earth. The creatures which now exist, and those which are in embryo, are all under thy government, all submit to thy authority.

What is man, that child of dust, that thou shouldst set thy heart upon him! O God, in whom I put my



trust, I adore and bless thee, for all the mercies I have received from thy hand.

Thou hast placed me in a distinguished rank ; the inhabitants of the sea, of the air, of the fields, and forests, are put under me ; all the creatures here below acknowledge me for their sovereign.

O Jehovah ! how magnificent is thy name ! thy praise resounds to the limits of the universe ; thy works proclaim thy glory, from eternity to eternity !

#### FOREIGN PLANTS.

ALL our different kinds of corn, and a great number of our vegetables, derive their origin from strange countries, commonly warmer than ours. Most of them come from Italy ; Italy had them from Greece ; and Greece, from the East. When America was discovered, a multitude of plants and flowers, hitherto unknown, were then found and transported into Europe, where they have been cultivated with much success. Even now the English are at a great deal of trouble to cultivate several North American productions in their own country.

The greater part of the different kinds of corn, which make the best nourishment both for man and beast, are grass plants ; but, though they at present cover our fields they are nevertheless exotics. Rye and wheat are natives of Little Tartary and Siberia, where they still grow without cultivation. Whence barley and oats come, we know not ; but are sure they are not natives of our countries ; were it otherwise, they would not require cultivation. Rice is a production of Ethiopia, whence it was first carried into the East, and afterwards into Italy. Since the commencement of the eighteenth century, it has been cultivated in America ; and at present they send vessels annually into Europe, laden with this useful grain. The French or Buck wheat comes originally from Asia ; the crusaders brought it to Italy, whence the Germans received it.

Most of our vegetables have a similar origin. Borage comes from Syria ; cresses, from Crete ; the cauliflower, from Cyprus ; and asparagus, from Asia. We are in-

debted to Italy for the chervil ; to Portugal and Spain, for the dill ; for fennel, to the Canaries ; and for anise and parsley, to Egypt. Garlic is a production of the East ; cives came from Siberia ; and radishes, from China. For the kidney-bean we are indebted to the East Indies ; for the gourd, to Astracan ; for lentiles, to France ; and for potatoes, to Brazil. The Spaniards brought tobacco into Europe in 1530, from Tobaca, a province of Yucatan, in New Spain.

The ornaments of our gardens, the most beautiful flowers, are all foreign productions. Jessamine comes from the East Indies ; the Spanish alder, from Persia ; the tulip, from Cappadocia ; the narcissus, from Italy ; the lily, from Syria ; the tuberose, from Java and Ceylon ; the pink, from Italy ; the aster, from China, &c.

Let us acknowledge, with gratitude, these various presents from heaven. With what goodness has the Lord provided for our pleasure and happiness—in rendering even the most distant countries tributary to us ! But let us learn also to know the constitution of the globe on which we dwell. There is a universal transmigration upon the earth. Men, animals, and vegetables are transplanted from one region to another. And this transmigration shall end only with our globe.

Into whatever part of the world it may please thee, O Lord, to transport me, may I endeavour to act uprightly, and bring forth fruit, not only for the good of my contemporaries, but also of posterity ; until I arrive in those regions of bliss and perfection, where nothing shall be subject to change !

## JULY II.

### THE METAMORPHOSIS OF THE CATERPILLAR.

THE transformation of a caterpillar into a butterfly is certainly one of the most curious phenomena of nature, and highly merits our attention. The manner in which caterpillars prepare themselves for their change is truly astonishing. They do not immediately become butterflies ; but they pass to it through a middle state. After

having cast their skins three or four times, they strip off their last coat, and become a substance which in no respect resembles a living créaturé. They then wrap themselves up in a hard shelly covering, called the chrysalis or aurelia, and which somewhat resembles a child in its swaddling clothes. In this state they continue two or three weeks, sometimes six or ten months ; till at length they issue from this species of sepulchre, under the form of butterflies.

There are properly two kinds of butterflies ; the wings of the one are raised, those of the others lie flat. The first fly during the day ; the latter, during the night. The caterpillars of the nocturnal butterflies, or phalenæ, spin themselves a cone, and shut themselves in it when the time of their transformation approaches. Those which are to be diurnal butterflies hang themselves in the open air to a tree, a plant, a lath, a wall, or some such thing. In order to this, they make themselves a very small web, with very fine thread ; and then, turning themselves upside down, they suspend themselves so that their head inclines a little towards the top. Some caterpillars, and especially the hairy or prickly ones, continue suspended in this state perpendicularly, with the head downward. Others spin themselves a thread which goes round the middle of their bodies, and is fastened at both sides. In one or other of these two ways all the diurnal butterflies prepare themselves for the grand change which they are to undergo. Thus, the two species of caterpillars, the diurnal and the phalenæ, bury themselves alive, so to speak, and seem to wait patiently the end of their caterpillar state, as if they foresaw that after a short repose they should receive a new existence, and should manifest themselves under a splendid form.

The death and resurrection of the just cannot be better compared than to the metamorphosis of the caterpillar into a butterfly. To genuine Christians, death is only a species of sleep ; a sweet rest after the pains and miseries of this life ; a moment, during which they are deprived of life and motion, only that they may appear afterwards with more glory, and enter into a new and better state of existence.

What is a caterpillar ? A blind, creeping, despicable

worm, which, while it drags on its life, is exposed to an infinity of accidents and persecutions ; and has man a better state in this world ?

The caterpillar prepares itself with the 'greatest care for its change, and for that state of inaction and weakness in which, for a short time, it must remain. It is exactly the same with a true believer. Before death comes, he prepares for this great revolution ; and he waits with tranquillity and joy the happy moment in which he shall enter into a better state.

The sleep of the caterpillar does not last for ever ; it is only the forerunner of a new perfection. After its change it appears in a more pleasing and splendid form. First it creeps upon the ground ; afterwards it springs up, and mounts into the air by means of its wings. At first it was blind ; now it is provided with good eyes, and enjoys a thousand pleasing sensations, which were unknown to it before. Lately, it stupidly confined itself to a very gross nourishment. At present, it goes from flower to flower, lives on honey and dew, and varies its pleasures continually.

In all this, we may observe a lively emblem of the death and resurrection of a righteous man. His weak and earthly body shows itself after the resurrection in a brilliant, glorious, and perfect state. As a mortal man, he was attached to the earth, subject to various passions, and occupied with sensual and terrestrial objects. But after the resurrection, his body is no longer confined to the earth ; he soars above thousands of worlds ; and, with a steady and penetrating eye, he takes in all nature at one view. His soul rises infinitely higher still ; he approaches the Deity, and is absorbed in the most sublime meditations. Before his death, he was comparatively blind in his search after truth ; now he sees and can contemplate its greatest lustre. His body being spiritual, glorious, and incorruptible, he no longer desires gross aliments to satisfy his hunger and thirst ; different sensations constitute his felicity at present ; he lives on heavenly food, and his heart overflows with unmixed joy.

Reader, does not this teach thee an important lesson ? If this be the glorious change thou expectest, make a

timely and effectual preparation for it. "If our present state be but transitory and imperfect, let us not make it our chief object, nor our end. Let not the few moments we have here appear to us with the consequence of eternity!"

### JULY III.

#### THE SILKWORM.

THE genus of caterpillars, which is divided into general classes, one of which comprehends the diurnal, the other the nocturnal butterflies, is farther divided into different families, each of which has its distinct characteristics and properties. To one of these families the appellation of silkworm is given. This caterpillar, like the other, is composed of several moveable rings; and is well provided with feet and claws, to catch hold, and fix itself wherever it pleases. It has two rows of teeth, which do not act upwards and downwards, as ours do; but from right to left, which it uses to saw, cut, and slope out the leaves. All along the back, we may see through its skin a vessel which seems to contract and dilate at intervals; and which performs the functions of the heart. At each side this animal has nine orifices, which answer to so many lungs, and assist the circulation of the chyle, or nutritive juice.

Under the mouth it has a sort of reel, with two holes, from which it emits two drops of gum, with which its bag is filled. These are like two distaffs, which continually furnish the matter of which it makes its thread. The gum which runs through the two orifices, takes that form, and lengthens out into a double thread, which immediately loses the fluidity of the liquor of which it was formed, and acquires the consistence necessary to support or wrap up the worm when the proper time is come. It connects the two threads into one, gluing them together by means of its fore paws. This double thread, notwithstanding it is very fine, is nevertheless strong, and of an astonishing length. Each is formed of a thread 500 German ells long. And as this thread is double

through its whole length, each cone contains 1000 ells, the whole of which weighs only two grains and a half!

The life of this animal, while it is in its caterpillar state, is very short. Nevertheless, it passes through different states, which insensibly bring it to perfection. When it comes out of the egg it is extremely small, and perfectly black; but its head is of a more shining black than the rest of its body. Some days after, it begins to grow whitish, or of a dark grey; afterwards its coat becomes dirty and ragged: then it throws it off, and appears in a new dress. It now becomes much larger and whiter, but a little tinged with green, because it feeds on green leaves. After a few days, the number of which varies according to the degree of heat and the nature of its food, it ceases to eat, sleeps nearly two days, then frets, is exceedingly agitated, and becomes almost red with the efforts it makes: its skin wrinkles and shrivels up; it then throws it off a second time, and throws it aside with its feet. Thus, in three weeks or a month, it has two new dresses. It begins then to eat afresh, and might pass for another animal; its head, colour, and whole form being so very different from what they were before.

After having fed for a few days, it falls again into a kind of lethargy; in recovering from which it once more changes its garment. This is the third skin it has thrown off since it came out of the shell. It continues to eat a little longer; then, renouncing all food, it prepares itself a retreat, and draws off its reel a thread with which it covers itself in the same manner as we would wind thread about an oval piece of wood. This covering consists of threads of silk extremely fine. It rests quietly in the cone which it has spun; and at the end of fifteen days it eats its way out, if it be not killed by being exposed to the heat of the sun, or that of an oven. The silk cones are thrown into warm water, and stirred about with twigs to remove the loose threads; and then the silk is wound off in a reel, made expressly for the purpose.

Thus it is to a worm or caterpillar that we owe the luxury of our clothing. By means of that liquor whence it derives its thread, it furnishes us with silk

and velvet. This reflection is well calculated to humble us. What! can we be vain of the silk we wear? Let us consider to whom we owe it, and how little we ourselves contribute to that which ministers to our vanity. Let us consider that even the most despicable things have been created for the use and gratification of man. A worm, which we can scarcely deign to honour with a look, becomes a blessing to whole provinces; a considerable object of commerce, and a source of riches.

Many persons resemble the silkworm in this; they pass a great part of their lives in feeding their bodies: but how few of them render themselves useful to the world by their labours! Let us henceforward consecrate, with a noble zeal, our strength and talents to the good of our fellow-creatures; and incessantly labour to render them happy.

## JULY IV.

### THE RAINBOW.

WHEN the sun darts his rays on the drops of water that fall from a cloud, and when we are so placed that our backs are towards the sun, and have the cloud before us, then we see a rainbow. The drops of rain may be considered as small transparent globes, on which the rays fall, and are twice refracted, and once reflected; hence the colours of the rainbow, which are seven in number, and are arranged in the following order—red, orange, yellow, green, blue, indigo, and violet. These colours appear so much the more vivid, as the cloud behind is darker, and the drops of rain fall thick and fast. The drops falling continually produce a new rainbow every moment; and as each spectator has his particular situation, from which he observes this phenomenon, it so happens that no two men, properly speaking, can see the same rainbow. This meteor can last no longer than the drops of rain continue to fall.

If we consider the rainbow merely as a phenomenon of nature, it is one of the finest sights imaginable. It is the most beautiful coloured picture which the Creator

has placed before our eyes. But when we recollect that God has made this meteor a sign of his mercy, and of the covenant which he has condescended to enter into with man, then we shall find matter in it for the most edifying reflection. When the rain is general, there can be no rainbow ; as often, therefore, as we see this beautiful meteor, we may conclude, with certainty, that we need fear no deluge ; for to effect one there must be a violent rain from all parts of the heavens at once. Thus, when the sky is only covered on one side with clouds, and the sun is seen in the other, it is a proof that these gloomy clouds shall be shortly dispersed, and the heavens become serene. Hence it is that a rainbow cannot be seen unless the sun be behind, and the rain before us. In order to the formation of the bow, it is necessary that the sun and the rain should be seen at the same time. If the sky be too bright, no colours can be seen ; therefore, where this phenomenon appears, the horizon must be covered with dark clouds. Besides, there can be no coloured bow without the action of the sun, and the refraction of his rays. All these considerations should naturally lead us to pious reflections.

As often as we see the heavens adorned with the beautiful colours of this bow, should we not say to ourselves, How great is the Majesty of God in everything his hands have formed ! How great is his goodness towards his creatures ! Still we see that God remembers the world in mercy. Let all mankind bow before and adore him who keeps his covenant, and fulfils his merciful promises. He has not as yet destroyed the world, and he never will drown it. Let his name be adored and blessed to all eternity !

But there is another reflection which the rainbow should lead us to make : when we see it, we have the rain in our face, and the sun behind us. This is an emblem of life ; our faces may be bathed with tears, yet the Sun of Righteousness shall rise upon us with healing on his wings ; Mal. iv. 2.



## JULY V.

## BIRDS' NESTS.

THE construction of nests shows us a multitude of remarkable objects, which cannot be considered with indifference by a reflecting mind that delights in information.

Who can help admiring those little regular edifices, composed of so many different materials, collected and arranged with so much skill and labour; constructed with so much industry, elegance, and neatness, without any other tools than a beak and two feet! It is not astonishing that man can erect great edifices according to all the rules of art, especially when we consider that these artists are endued with reason, and that they have instruments and materials in abundance. But that a bird, which is destitute of almost every requisite for such a work, which has only its bill and feet, should, notwithstanding, be capable of uniting so much address, regularity, and solidity, in constructing its nest, is what cannot be too much admired. But this deserves to be more particularly considered.

Nothing is more wonderful than the nest of a goldfinch. The inside is lined with cotton, fur, and fine silky thread. The outside is formed of thick moss; and that the nest may be less remarkable, and less exposed to the eyes of passengers, the colour of the moss chosen for the purpose resembles that of the bark of the tree or bush in which the nest is built. There are some nests in which the hair, down, straw, &c. are curiously crossed and interwoven. There are others, the pieces of which are neatly joined and tied together with a thread, which the bird makes out of fur, hemp, hair, but more commonly with spiders' webs. Other birds, as the blackbird and lapwing, after having made their nests, plaster them with a thin coat of mortar, which connects and fastens all that is below, and which, by the help of a little down or moss, which they attach to the mortar while soft, is very proper to render the nest warm. Swallows' nests are of a very different structure from all others. They

need neither wood, hay, nor flax. They understand how to make a kind of plaster, or cement, with which they form for themselves and all their family a neat, secure, and convenient lodging. In order to moisten the dust, of which they make their nest, they pass and repass close to the surface of the water, and wet their breast; then with the dew which they sprinkle over the dust they saturate it sufficiently, and work it up with their bills.

But the nests which deserve to be admired most are those of certain Indian birds, which they artfully suspend to the branches of trees, to defend them from the ravages of several animals and insects. Each species of birds has its peculiar manner of placing its nest. Some place them in houses, others in trees. Some under the grass, some in the earth; but always in such a manner as may best contribute to their security, the rearing of their young, and the preservation of their species.

Such is the wonderful instinct of birds in the construction and disposition of their nests; and from this may we not certainly conclude that they are not simple machines! How much industry and understanding, cunning and sagacity, activity and patience, do they manifest in the construction of their nests! And is it not evident that in their work they propose to themselves certain ends? They make their nest like a hollow hemisphere, that the heat may be the better contained in it. The outside of the nest is covered with matters more or less coarse, not only to serve as a foundation, but also to keep out the wind, and prevent the entrance of insects. The inside is lined with more delicate materials, such as wool, feathers, &c., so that their young may lie soft and warm.

Is it not a species of reason that teaches the bird to place her nest so as to be sheltered from the rain, and out of the reach of rapacious animals? Where has she learned that she is to have eggs, and that there must be a nest to prevent them from falling to the ground, and to keep them warm. Who has taught her that the nest must not be too large, as the heat would not then be properly concentrated about the eggs? and that it must not be too small, because, in that case, there would not be

room sufficient to hold the young? How does she know to make the nest in just proportion to the number of the young who are to be hatched? Who has taught her the exact time, and to calculate so correctly, that she never lays her eggs before her nest is finished? All that has been said hitherto, in answer to these and similar questions, is quite unsatisfactory, and does not account for these mysteries of nature. We have not a sufficient knowledge of the souls of animals to answer such queries.

But however it may be, and of whatever nature the faculties of birds are, it is at least certain that they are the effect of a wise and powerful cause. And as the animals have not a capacity to know their Creator, let us use the reason with which he has endowed us, to increase continually in divine knowledge, employing all our faculties to glorify our omniscient Creator!

## JULY VI.

### NATURE AN UNFAILING SOURCE OF PLEASURE.

LET us turn our eyes to whatever part of the creation we please, we everywhere find something that interests either our senses, our imagination, or our reason.

Universal nature is formed to present us with a multitude of pleasing objects, and to procure those varied pleasures which continually succeed each other. The taste we have for variety is continually excited, and always gratified. There is no part of the day but brings new pleasures, either to our senses or imagination. While the sun is above the horizon, plants, animals, and a thousand pleasing objects attract our notice; and when the curtains of the night are let down, the majesty of the firmament transports and charms us. Everywhere nature labours to surprise us with new pleasures. The smallest worm, a leaf, or a grain of sand, presents us with subjects of admiration.

Blind and stupid we must be, if we are not struck with that infinite diversity, and do not acknowledge in it the goodness of the Creator. The same spring that

waters the valley quenches our thirst, pleases our ear, and invites us to sleep. The shady forest, which defends us from the intense heat of the sun, where we find such melodious coolness, and where we hear the varied melody of so many birds, nourishes also a multitude of animals which are themselves food for us. The same trees, whose blossoms delighted our eyes a few months ago, will soon produce delicious fruits; and the fields, now covered with waving corn, will soon furnish us with plentiful crops.

Nature presents us with no object which is useful to us in one respect only. Providence has kindly chosen the green colour, which is so refreshing and friendly to the eye, to be the covering of the whole earth. This, of itself, would be sufficient to cheer our sight; but variety has added new charms to it: hence that skilful blending of colour, those different gradations of light and shade, and those different degrees of green, from the brightest to the most dark. Every family of plants has its peculiar and constant colour. Landscapes covered with woods, brambles, pulse, grass, and corn, present us with a magnificent picture, where the tints of green are infinitely diversified, crossing and intersecting each other, and blending themselves, so as to be insensibly melted into each other, and yet always in perfect harmony.

Every month of the year presents us with different plants, and new flowers. Those which have served their purpose are replaced by others; and all coming in succession, prevent any void in the vegetable kingdom.

But to whom do we owe all these numerous and diversified presents? Who is it that provides for our wants and pleasures with so much goodness and munificence?

“Go and ask universal nature; the hills and the valleys will tell thee; the earth points him out; and the heavens are a mirror, in which we may view his glories. Storms and tempests proclaim him; the voice of thunder, the rainbow, the snow, and the rain publish his wisdom and goodness. The green meads, the fields covered with ripe corn; the mountains covered with forests, which lift their heads above the clouds; the trees laden

with fruit; the gardens enamelled with flowers; and the rose, with all its brilliant dress, all bear the impress of his hands. The birds celebrate him with their melodious notes. The bounding flocks; the stag in the midst of the forests; the worm of the earth; the whale, the king of the seas, that spouts the waves on high, overturning and drowning ships; the terrible crocodile, and that moving mountain, the majestic elephant, the carrier of towers; all the innumerable host of animals which people the air, the earth, and the sea, declare the existence and proclaim the glory of the strong God."

How unpardonable should we be, were we deaf to this general voice of nature! Let us, who are so favoured as to be the spectators of the wonders of our God, come and render him (in the presence of his creatures) that homage, gratitude, and adoration which he has so just a right to claim from us. Let us not shut our ears against the voice of his grace! Let us not harden our hearts against the kind invitations of his goodness! Let us look around us; everything brings his kindness to our remembrance; everything prompts us to gratitude and joy. The rich lands, where our nourishment grows; the fields, where the flocks feed; the forests, which provide both shelter and fuel; the heavens, which cover and enlighten us; all, all invite us to grateful joy. Let praise fill our whole souls. Let a due sense of our advantages and the mercies of our God accompany us, both in public and in private. We shall find that no satisfaction is more solid, durable, or more suitable to human nature, than the calm pleasure which a contemplation of the works of the Lord affords. The more we study the beauties of nature, the more we shall be persuaded that God is a being of mercy and love; and that the Christian religion is a source of joy, and a continual motive to gratitude and adoration.

## JULY VII.

## REFLECTIONS ON A FLOWER-GARDEN.

LET us now take a view of the flower-garden, and consider the numerous and diversified beauties which are collected in so small a space. The art and industry of man have made it a superb theatre of the most beautiful flowers. But what would this garden be without care and cultivation? A wild desert, producing nothing but thorns and thistles. Such is youth, when a proper education is neglected. But when young persons receive the necessary instructions early, and are brought under proper discipline, they are like lovely flowers, whose appearance is now delightful, and who will shortly bring forth fruit useful to society.

Behold the night-violet, which towards evening scents our gardens with its perfume! All other odours are absorbed in this. But it has no beauty, and scarcely resembles a flower. It is small, and of a grey colour, inclining to green, so that it scarcely can be distinguished from the leaves. Modest, without show or pretensions, it perfumes the whole garden, though it can scarcely be noticed in the multitude; and it is difficult to believe that a flower of so mean appearance can produce an odour so sweet and pleasing. It resembles a person who is not beautiful, but who has a fine understanding; and whose outward deficiency Providence has amply compensated by the most durable gifts. The righteous man often does good in secret, and diffuses all around him the odour of good works. And when we wish to be acquainted with this beneficent man, we find that there is nothing peculiarly distinguishing in his external appearance or rank.

But in the carnation both beauty and a fine scent are united; and it is, without doubt, the most beautiful of all flowers. It almost equals the tulip in its colours, and it surpasses it in the multitude of its leaves, and in the elegance of its form. A little bed of carnations perfumes a whole flower-garden. This flower is the

emblem of a person, in whom sense and beauty are united, and who knows how to conciliate the love and respect of his fellow-creatures.

Let us now observe the rose: its colour, form, and scent are all pleasing; but it appears to be the most weak and transitory of all; it soon loses those charms which distinguish it from other flowers. This is a useful lesson to those who have great beauty, and from which they may learn not to trust in their charms, or be vain of their short-lived excellence.

In general, it is a melancholy thing to see the ground, in this beautiful season, covered with so many fallen withered flowers. But we should not complain that Providence has given so little stability to flowers. The world is a great theatre, on which the same actors do not always appear; it is right that those who have acted their part should go off the stage, to make way for others. The diversity of the works of God requires this; and the diversity constitutes a great part of their perfection. Besides, the charms of novelty affect us most; therefore the former objects should give place to new ones. If the flowers preserved their splendour for a whole year, they would not please us so well as they now do by lasting only a few months. Their absence causes us to long for their return; on the contrary, their continual presence would satiate and disgust us. After having considered an object in all points of view, we have in some sort exhausted its beauties, begin to feel indifference to it, and then aspire after new pleasures. The variety and continual succession of earthly goods is a means which Providence employs to make our lives continually pleasant.

Such is worldly happiness. All flesh is grass, and the glory of man is like the flower of the field; the grass withereth, and the flower falleth off. The lilies and roses of a beautiful face wither, as well as the flowers of the garden; and death leaves no vestige of them behind. Let us, therefore, wisely seek rest and happiness in solid and eternal good. Wisdom, piety, and the blessings of genuine Christianity never fade. They are the inexhaustible source of an endless joy.

## JULY VIII.

## THE PHENOMENA OF A THUNDER-STORM.

HOWEVER formidable the phenomena of a thunder-storm may be, they have something so grand and remarkable in them, that the different effects produced by them deserve well to be examined. This examination is the more necessary, as we are often prevented by excessive fear from considering this majestic spectacle with sufficient attention.

When a stormy cloud, which is no other than a collection of vapours strongly electrified, approaches near enough to a tower or a house, or to an unelectrified cloud, so that a spark issues from it, that explosion takes place which we term a clap of thunder. The lightning which we see is the electric fire, or, as some call it, the thunderbolt. Sometimes we see only a sudden and momentary flash; at other times, we see a train of fire in a zigzag form. The explosion which accompanies the lightning shows that the vapours which form the thunder, being suddenly agitated and inflamed, dilate the air with violence.

After each electric spark a clap is heard; this is the thunder, which is sometimes composed of many claps, or is prolonged and multiplied by echoes. There is always some interval between the flash and the clap, and this may in some degree enable us to judge of the greatness and imminency of the danger; for it requires a certain space of time for the sound to reach our ear from the place of the cloud; whereas the lightning reaches our sight with inconceivable rapidity. As soon, therefore, as we perceive the lightning, we have only to count the seconds on our watch, or feel how often our pulse beats, between the flash and the clap. Whoever can count about ten pulsations or seconds, from the time he has seen the lightning till he hears the thunder, is a quarter of a league distant from the thunder-cloud; for it is calculated that the sound takes the time of forty pulsations to pass through the space of a league.



Lightning does not always proceed in a right line ; it often winds about in all directions, takes a zigzag form, and sometimes does not flash till very near the ground. The matter of the lightning which reaches the earth, or is ignited near to it, never fails to strike. But sometimes it has not a sufficiency of strength to reach us, and, like a bomb ill-charged, it is dissipated in the atmosphere, and does no evil. When, on the contrary, the ignited exhalations come near the ground, they make terrible havoc. But as deserts and uncultivated places, and places where there are neither houses nor inhabitants, occupy the largest part of our globe, consequently the lightning may fall many thousands of times without doing any real damage. The course of the lightning is peculiarly singular, and cannot be ascertained. It depends on the direction of the winds, the quantity of exhalations, the state of the earth beneath, and other circumstances.

Lightning goes in all directions, wherever it may meet with combustible matter. As one grain of a train of gunpowder, being ignited, communicates the flame to all the rest, till the whole train is set on fire ; so lightning proceeds on combustible matter, consuming everything it meets with.

We may form some judgment of the power of lightning, by the prodigious effects it produces. The heat of the flame is so intense, that it burns and consumes all combustible bodies ; it melts metallic substances, but often leaves uninjured the matters in which they were contained, when they are so porous as to give it a free passage. It is owing to the velocity of lightning that the bones of men and animals are calcined, without the flesh being hurt ; that the most solid buildings are beat down ; that trees are cloven, or torn up by the roots ; the thickest walls pierced through ; and stones and rocks are after broken, and reduced to powder.

Let us seriously reflect on these strange and formidable phenomena. How many wonders does one thunder-storm exhibit ! We see a black and gloomy cloud, but this is the tabernacle of the Most High ; it descends towards the earth, but it is the Lord who bows the heavens, and comes down, having the darkness under his

feet, 2 Sam. xxii. 10. The wind arises, the storm begins; but it is God who is in the whirlwind, for he walketh on the wings of the wind, Ps. civ. 3. At his command the clouds are dispersed, and the hail, the lightning, and the thunder fly abroad. Hear attentively the terrible sound of his voice, and the threatening which proceeds from his mouth. He darts his lightning from one end of heaven to the other, and his light to the extremities of the earth. Then a terrible voice is heard; the thunder roars, and the blow is already struck, before even the lightning is perceived, Job xxvii. 2—4. The Lord thunders in the heavens; he darts forth his lightnings, and sends them hither and thither; but though his terrible fires alarm the universe, his beneficent hand abundantly nourishes all his creatures.

## JULY IX.

### THE ANTS.

THE ants, as well as the bees, may be considered as a little republic, which has its peculiar government, law, and police. They live in a sort of city, divided into various streets, all of which terminate at different magazines. Their diligence and industry, in procuring and using the materials they require for the construction of their ant-hills, are admirable. They all unite in digging the earth, and carrying it afterwards out of their habitation. They collect a great quantity of stubble, grass, and twigs, of which they form a heap. At first sight, this appears very irregular; but in the midst of this apparent disorder much art may be discovered, when it is examined with attention. Under the domes or little hills which cover them, and which are always so contrived as to throw off the water, there are galleries which communicate with each other, and may be considered as the streets of this little city.

But what is most remarkable, is the care the ants take of their eggs, of the worms which come out of them, and of the nymphæ which are formed from the latter.

They carry them carefully from one place to another ; they feed their young, and remove with the most tender solicitude whatever might injure them. They even take care to maintain a proper degree of warmth around them. Their severe labour to collect provisions during the summer, has principally for its object the support of their young ; for, as to themselves, they have no need of nourishment during winter, since they continue asleep, or in a state of insensibility, till the return of the spring. As soon as their young come out of the eggs, they are employed in feeding them ; and this gives them a great deal of trouble ; for in general, they have many houses, and they carry their little ones from one habitation to some other, which they design to people. According as the weather is hot or cold, wet or dry, they bring their chrysalises towards the surface of the earth, or carry them downward. In mild weather, they bring them near the surface ; and sometimes, after rain, they even expose them to the sun, or to a gentle dew, after a long drought. But when night, cold, or rain approaches, they take their dear nurslings in their paws, and descend so far in the ground, that one is obliged to dig more than a foot deep in order to find them.

There are several species of these insects. The wood-ants never dwell but in forests and thickets, and do no damage to the fields. There are two sorts of these, the one red, the other black. Some of them lodge in the ground, in dry places, and ordinarily choose those parts where they find the roots of fir or birch-trees, and there fix their habitation. Others establish themselves in old trunks of trees, high enough above ground to be out of the reach of its humidity. They make themselves apartments in the cavities of the trunk ; and cover them with straw and such like matters, to shelter them from the rain and snow.

The field-ants are also either red or black, like the former, but much smaller : they settle either in corn-fields, or common pasturages. In dry weather, they bury themselves very deep ; but in rainy weather they elevate their habitations more or less, according to the degree of moisture : but when this abates, they fail not

to return to their former subterranean habitations. It is farther worthy of observation, that the ants acquire wings ; and that towards autumn they are seen in great multitudes hovering over ditches, ponds, &c.

“ But do such mischievous insects deserve our notice, which make such havoc in our fields and meadows ? By their operations under ground, they make the earth hollow, tear it up, and hinder plants and vegetables from growing.” They are still farther censured. “ Ants,” it is said, “ are enemies to bees and silkworms ; do much damage to flowers, and injure the roots of young trees.” It is farther affirmed that “ they devour the buds and shoots ; and that in getting under the bark of trees, they gnaw them to the quick, and destroy their growth.” Hence it is that they are so cruelly persecuted and destroyed wheresoever they are found. If the ants collected honey, though it were at the expense of a million of other creatures, they would, notwithstanding, be highly valued ; but because their labours injure a few useful plants, we imagine ourselves authorized to exterminate them. But, supposing even that they do some hurt, are they the less worthy of our attention on that account ? Are no animals but such as are of particular use to us, worthy of notice ?

Let us cast aside this prejudice. Even the ants may contribute something to our instruction and amusement. The construction of their limbs, their industry, their indefatigable diligence, the police of their republic, their tender care of their young, and, perhaps a thousand other properties, which as yet we know not, may convince us of the wisdom of that Being, who is their Creator as well as ours. For there is not one of the works of God which is not good, or worthy our admiration ; however useless, or even injurious some of them at first sight may appear. “ The Supreme Creator, by whom all things exist, has created nothing without design ; nothing but what has its proper use, and answers the end for which it was formed. The trees have not a leaf, the fields a spire of grass, nor the flowers a single leaf, which is useless : the mite itself has not been created in vain.” Even the despicable ants may teach us this great truth ;

and if we profit as we ought by their instructions, we shall never leave an ant-hill without having made some progress in wisdom and goodness.

## JULY X.

### HAIL.

HAIL is nothing but drops of rain, which, congealing in the air, fall down in pieces of a spheric, oblong, and angular form. Should it appear strange that, in the very warmest season of the year, vapours are found to freeze in the atmosphere, let it be considered that, even in the greatest heats, the upper region of the air is cold, and often filled with snow. Were not this the case, how could the tops of high mountains continue covered with snow, even in the summer months? In the hottest regions of America the cold is so intense on the tops of the highest mountains, that the traveller is in danger of being frozen to death. From this excessive cold in the upper regions of the atmosphere, we should have snow even in summer, if the frozen particles did not melt before they reached the earth. When the particles of snow unite together, the drops begin to freeze; and as in falling they pass suddenly through warmer regions of the air, it happens that before this warmth can have penetrated them, their cold increases so much as to freeze them entirely.

It might be supposed that, on the contrary, this cold should diminish in proportion as they pass through warmer air; but when, in winter, water which has been exposed to the open air is brought into a warm apartment, what is the consequence? It freezes and becomes ice, which would not have taken place had it been put in a cold room. This is precisely the case with the meteor in question. For, when those cold bodies pass suddenly through a warm region of the air, their cold increases to such a degree, as to freeze them entirely. To this the volatile salts, which are more or less diffused through the atmosphere, contribute much. We need not therefore be surprised that storms are not always ac-

accompanied with hail; for, in order to produce this effect, there must be an abundance of saline vapours to cause the drops to congeal suddenly. Although hail is more frequent in summer, yet it falls also in the other seasons; for, as in every season of the year saline exhalations may abound in the atmosphere, consequently it may hail in winter, autumn, and spring.

The form and size of the hail are not always alike. Hailstones are sometimes round, sometimes concave, and hemispherical; and often conic and angular. Their ordinary size is like that of a small shot; they are seldom as large as nuts. It has, however, been asserted, that some have fallen as large as a goose's egg. The difference we observe in the form and size of hailstones may proceed from accidental causes. Winds, and especially those which are impetuous, and blow in contrary directions, doubtless contribute much to this. Besides, a hailstone, in falling, may meet with many other cold particles, which may considerably augment its bulk; and often several hailstones unite together, and form one large one.

When hailstones are very large, they undoubtedly do inexpressible damage to crops, vines, fruits, and buildings; but this does not authorize us to look on them as a scourge from heaven, as a judgment or chastisement from the Lord. If a violent hail-storm sometimes lays waste several acres of land, and breaks thousands of windows, such desolations may be nothing in comparison of the good which the storm produces. Hail manifestly cools the air in the burning heats of summer; the nitrous and saline moisture which they diffuse contributes much to the fertilization of the earth. It is very remarkable that, although all the meteors appear to succeed each other without the least regularity; and though in one year they are different from what they were in another; yet, notwithstanding this apparent disorder, constant fertility is produced.

Here, again, God manifests his wisdom and goodness. May we glorify him in the hail and in the tempests, for his beneficent hand does admirable things, and never ceases to give us an abundance of food.

## CRYSTALLIZATION.

WE observe that the various species of animals are always continued of the same form throughout all their generations. We see, also, that the various kinds of vegetables always produce their like with undeviating certainty. But it is not so obvious that the parts of all unorganized matter of different kinds have a tendency to unite, after the same manner, for each species; yet attentive observation will show that this is the fact.

When the particles of bodies unite so as to form a regular solid, having its parts symmetrically situated, the solid is called a crystal, and the process of its formation is called crystallization. Most or all bodies occur in a crystalline form, or are capable of being made to assume that form; and it is found that the same body always tends to take the same figure when it crystallizes, each kind of body having its own peculiar form. Thus, common salt crystallizes in cubes, Epsom salt in six-sided prisms, sugar-candy in oblique four-sided prisms, with wedge-shaped summits; and carbonate of lime crystallizes in a rhomboidal form.

It is not here to be supposed that crystallization agrees with the formation and increase of organic beings. Crystals increase by the apposition of parts on the exterior surface; vegetables, by the expansion of their parts, from a diffusion of matter through their internal structure.

In order that bodies may take the crystalline form, it is necessary that their parts should be at liberty, to move freely among each other, which happens when the bodies are in a state of fusion by being melted; or when they are dissolved in some fluid, called the solvent. In the first case, they crystallize when slowly and very gradually cooled; in the second case, when the solution remains undisturbed, and the solvent is slowly and gradually withdrawn by evaporation, the crystals are formed. A common method is, to evaporate the liquid to a certain consistency, by boiling, and then to leave it to cool without agitation. If well formed crystals, of the same

kind, be put into the solution, these will increase in magnitude; and with a little address, very large crystals may be obtained. Almost every sort of bodies under proper circumstances will crystallize on becoming solid.

The crystalline form of tallow or fat is seen on the edges of the vessel wherein it has cooled. When melted metal is left to cool, till a crust is formed, on removing that crust we observe the crystalline appearance; but in those combinations which are by chemists denominated salts, of which there are above two thousand sorts, this process is most evident. And it is farther remarkable that most crystals contain, in combination, a certain and definite portion of water. The forms of crystals are not only of the same regular figures for the same bodies, but those figures are terminated by plane surfaces, and consequently their edges are straight lines.

The regularity asserted is not apparent at the first view, for the same body is often found crystallized in many different forms. However, the crystals being examined, we discover that they can be split only in certain directions; and after being cut in those directions, there always results a given or determinate form for each body; and however it is afterwards cut, it still exhibits that figure. It is well known to jewellers, that crystalline gems can only be divided in certain directions, so as to admit of smooth surfaces, capable of a good polish.

The primitive forms of crystals are indeed but few; but different bodies generally crystallize under some form different from the primitive one, which may be considered as the nucleus; the secondary forms are, in general, owing to the nature and quantity of the substance, and the circumstances of the formation. The forms of the nucleus are reducible to six: 1. The parallelepiped, including the cube, rhomb, and all solids of six faces, parallel two and two; 2. The tetrahedron; 3. The octahedron; 4. The regular hexahedral prisms; 5. The dodecahedron, with equal and similar rhomboidal planes; and 6. The dodecahedron with triangular planes. Yet these primitive forms themselves differ, with very few exceptions, either in the angles contained by their sides, or the proportions of their linear dimensions.



Do not these phenomena indicate that some power is attached to each atom of matter by the hand of him who formed it; and not only so, but that the several corpuscles are by that power disposed to unite, not in any medley way, but according to one uniform manner. If not, why do they thus unite regularly, and after one only and peculiar manner, when, in solution or fusion, they are left to assume a natural arrangement. It must be considered as a beautiful law of nature, that she is directed ever to proceed in regular and orderly steps: here we see nothing out of place.

It is a general conclusion, that transparency arises in bodies from an uniformity of arrangement in the elementary parts which compose them; and it is worthy of notice, that perfect crystals are generally transparent, and many of them have the property of splitting the ray of light which falls on them. This is called double refraction. Thus, carbonate of lime, or calcareous spar, a rhomboidal crystal with obtuse summits, will show a double appearance of a line seen through it in a certain position. This property, no doubt, depends on the particular arrangement constituting the laminæ of the crystal.

While we witness so much uniformity and regularity in the works of God; while we see design in everything, and everything tending to promote the accomplishment of that design, may we not conclude that God has designed some great and good thing for us? And shall we not pursue that good? Shall we not, by an uniform and regular course, pursue the path of life, and perform the will of our heavenly Father, following that line of conduct alone, which he has marked out for the regulation of our lives, for our well-being, our present and final happiness?

## JULY XI.

### THE UTILITY OF STORMS.

WE should consider the phenomena of nature so, that the wisdom and goodness of our heavenly Father may be clearly apprehended by our understanding, and make

the deepest impression upon our heart ; and this duty should appear to us the more indispensable, because it is so much neglected by a multitude of inattentive, ignorant, and ungrateful people. It is true, that God sometimes makes use of natural phenomena to punish the sins of men ; but these particular cases do not prove that he does not propose chiefly, and in general, the benefit and welfare of the whole. Universal nature affords incontestable proofs of this. At present, let us consider a single phenomenon which is well calculated to convince us of this ; and concerning which we have great need to have our ideas rectified.

Are we not in general accustomed from our youth to pronounce the words thunder and lightning with terror ? Such is our injustice, that we never think but on those extremely rare cases, in which tempests have been prejudicial to a very small part of the universe ; while we shut our eyes against the great advantages which result from them to the whole of the creation. Alas ! we should soon change our tone if God, irritated by our murmuring and ingratitude, were to deprive us of the blessings which thunder and lightning produce. It is true, we are not capable of pointing out all the advantages resulting from them ; but the little which we know may suffice to fill our hearts with gratitude towards our great Benefactor.

Let us represent to ourselves an atmosphere loaded with an infinity of noxious and pestilential exhalations, which are still more and more augmented by continual evaporations from terrestrial bodies ; so many of which are corrupt and poisonous. This air we must breathe ; the preservation or destruction of our being depends on it. The salubrity or insalubrity of the air brings life or death. We all know how difficult respiration is in the stifling heats of summer, and what uneasiness and anxiety we then feel. Is it not, then, a great mercy from God, which merits our utmost gratitude, that a salutary storm comes to purify the air from all that might render it injurious ; that it sets fire to the saline and sulphureous particles, and thus prevents their dangerous effects ; that it cools the air, and, in restoring its elasticity, renders it proper for respiration ?

Without such storms destructive exhalations would be more and more corrupted and multiplied ; men and other animals would perish by thousands ; and a universal plague would render the earth a general graveyard. Which, then, is most reasonable ; to wish for, or fear storms ? To murmur at the slight mischief which they sometimes occasion ; or to bless God for the excellent advantages which they procure to the world at large ? Add to this, that not only men and animals profit much by the purification of the atmosphere from noxious vapours ; but the vegetable kingdom also gets much advantage by it. Experience teaches us that the rain which falls in a thunder-storm is more proper than any other for the fertilization of the earth. The saline and sulphureous particles which fill the atmosphere in the time of a thunder-storm, are brought down by the drops of rain, and become an excellent nutriment for plants ; to say nothing of the innumerable multitude of little worms, seeds, and insects, which is precipitated by the rain, and which may, by the assistance of a microscope, be easily discovered in the drops of water.

Reflections of this kind may serve to moderate that excessive fear which we have of thunder ; a fear which too plainly proves how little confidence we have in God. Instead of giving way to dreadful and terrific ideas, let us accustom ourselves to meditate on the majestic grandeur of a storm. Instead of conversing about the evils occasioned by lightning, let us speak of the great necessity and utility of thunder-storms. Instead of praying to God to avert such, let us rather entreat him to send them from time to time ; or else let us leave this entirely to that Supreme Being, who always governs the world with so much wisdom and goodness. As often as we see a storm, let us say in the fulness of our heart, and with strong confidence—Lord God Almighty ! it is thou who commandest the thunder, and directest the way of the lightning. We are in thy hand : thou alone canst save—thou only canst destroy. At thy command, the tempest shall either fertilize or destroy our fields. Thou art great, O Jehovah ! and thy power is inexpressible. How can we resist thee, or where can we fly to escape thy pursuing anger ? But art thou not our Father, and

we thy adopted children? Thou speakest to us by the thunder; but it is to bless, not to curse us. Blessed be thou, O Lord, from eternity to eternity, and let all the people say, Hallelujah! Amen.

## JULY XII.

### REFLECTIONS ON THE EARTH AND ITS ORIGINAL CONSTITUTION.

God has so constituted the earth, that it is fit for the production and growth of herbs, plants, and trees. It is compact enough to contain and hold fast the different vegetables, so that the winds cannot sweep them away; and yet it is light and moveable enough to permit the roots to sink downwards, and attract humidity and nutritious juices. When the surface of the earth is dry and parched, that very lightness causes the juices to ascend in the capillary tubes, to furnish the trees with necessary nourishment. Besides this, the earth is full of oily particles, and different juices, which serve for the growth of plants. And that all sorts of vegetables may grow and draw their subsistence from the earth, God has formed different kinds of earths, which serve us for a variety of purposes, such as potter's earth, clay, chalk, and gravel. Some serve to make bricks; others, to form buildings, walls, ovens, &c.; and others are employed in the potteries. There are also different earths, which are used in dyeing, and some are used in medicine.

Even the inequalities of the earth produce considerable advantages. A greater number and diversity of animals and plants may live on the mountains. They serve also to break the violence of the winds; they produce a greater variety of wholesome plants and fruits, which could not be so well produced on the plains. They contain in their bowels those metals and minerals which are so useful to us. It is from them that springs, and the greater part of rivers, produced by the melting of snows, by rains and other vapours, proceed. The stones which are inclosed in the earth serve for the construction of walls, and for the formation of lime and glass.

As to metals, their uses are innumerable. Let us only consider the great variety of tools which our labourers and artists use; and the utensils and moveables of all kinds which are made of different metals, and which furnish us with so many conveniences and ornaments. We also derive considerable advantages from the hardness and weight of these bodies.

No person can be ignorant of the great utility of minerals. Salt serves to season our food, and to preserve it from putrefaction. And the sulphureous particles of bodies render them combustible. Volcanoes, also, and earthquakes, whatever ravages they may sometimes occasion, are nevertheless, useful and necessary. If fire did not consume the sulphureous exhalations, they would be diffused so much in the air as to render it unwholesome. Divers warm baths, and various minerals and metals, could not be produced without these. We may impute it to our ignorance, if so many things appear useless to us. At the sight of certain phenomena of nature, which are sometimes noxious, we should always recollect this maxim: if God now and then permit certain apparent imperfections to take place, it is that they may contribute to the greater perfection of the whole. To judge aright of the works of God, and to acknowledge his wisdom in them, we must not consider them in one point of view, but examine the parts separately, and then the whole combined. Many things which we now consider as injurious, would then appear to be of incontestable utility: others, which appear superfluous, we should find to be necessary to the perfection of the whole; and we should see that their removal would leave a chasm in the empire of creation. How many things appear despicable to us, merely because we are unacquainted with their uses! Put a loadstone into the hand of a person who is ignorant of its virtues; he will scarcely condescend to honour it with a look. Let him be informed that the progress of navigation and the discovery of America are owing to that stone, and he will speedily form a different opinion of it. It is the same with a million of things which we despise, or judge ill of, because we do not know their use, and see not the relations which they bear to the whole of creation.

Lord ! the earth is full of thy goodness. All that is in and upon it, even the dust itself, is arranged in wisdom. How long have we travelled on earth, and how much of thy bounty have we seen ! May we consider it as our principal duty to apply ourselves more and more to know thee, and to pay thee that just tribute of gratitude and love which we owe thee, for the various blessings we derive from the earth !

### JULY XIII.

#### ON THE PHASES OF THE MOON.

ALL observations on the moon confirm the opinion that she has a particular motion, by which she turns round the earth from west to east. For after having been placed between us and the sun, she retires from her conjunction with him, and continues to go eastward, changing each day the point of her rising. At the end of fifteen days, she reaches the most easterly part of the horizon, at the time the sun sets with us. She is then in opposition. In the evening, when the sun retires, she rises above our horizon ; and sets in the morning nearly about the time the sun rises. If, then, she continue to describe the circle round the earth which she has begun and half finished, she will depart visibly from the point of her opposition to the sun, and be less and less distant from that luminary, rise later than when in opposition to him, till at last she has got so near as only to be discovered a little before his rising. This revolution of the moon round the earth explains why she rises and sets at such different times ; and why her phases are so different, and at the same time so regular. Every body knows that a globe illuminated by the sun, or by a flambeau, can receive the light only on one of its sides. At first sight, we are convinced that the moon is a globe which receives her light from the sun ; when, therefore, she is in conjunction, i. e., placed between the sun and us, she turns the whole of her illuminated side to him, and, of course, her dark part to us. She is then, consequently, invisible to us ; she rises with the sun in the

same region of the heavens, and sets also with him : this is called the conjunction, or new moon. But when the moon retires from the sun, and goes on towards the east, then she has no longer the whole of her dark side turned towards us ; a small part, a little border of the illuminated disk, comes in view. This luminous border is seen on the right side toward the sun, just at his setting, or even a little before ; and the extremities or points of this crescent are turned to the left, facing the east. The farther the moon recedes from the sun, the more visible she becomes ; till at the end of seven days, when she has performed the fourth part of her course, she discovers half of her enlightened face. The enlightened part is always towards the sun, and her dark part casts no light on the earth. Exactly half the moon being illuminated, the half of that half can only be the fourth part of her whole surface, and it is this fourth part which we see. Then the moon is said to have finished her first quarter, and to have entered her second.

In proportion as the moon departs from the sun, and the earth is found nearly between them, the light occupies a greater space in that part of the moon which faces us ; at the end of seven days, counting from the close of the first quarter, she is almost directly opposite to the sun ; and then her whole disk, perfectly illuminated, is presented to us. She then rises in the east, precisely at the moment when the sun sets in the west. Then is our full moon. The next day, the enlightened part is a little turned away from us, so that we see no longer the full enlightened face. The light seems to leave the western side by little and little ; stretching over that part which does not face the earth. This is the wane or decrease of the moon ; and the farther she advances, the more her obscure part increases, till at last, half the dark part, and consequently, half of the light side, are turned towards the earth : it has then the form of a semicircle ; and the moon is said to enter her last quarter.

Let us adore the wisdom and goodness of our Creator, who manifests himself to us in the phases and different aspects of the moon. By the admirable harmony which subsists between the motion of this planet on her own axis, and her motion round the earth, it so happens that

the moon always shows us the same half of her sphere which she has shown from the commencement of the world. For some thousands of years, this globe has finished her revolution in 27 days and 8 hours. Regularly, and at the same periods, she has enlightened at one time the nights of our climate; at another, the most distant countries. With what goodness has it pleased the divine wisdom to grant our earth a faithful companion, to enlighten almost half our nights! Alas! we do not sufficiently value this wise appointment of the Creator. But there is a people who know better than we how to estimate this advantage, to whom the light of the moon is indispensable. Doubtless, they feel more gratitude for this present from heaven than we generally do.

The continual changes of the moon, both in respect to her phases and her course, are a lively emblem of the revolutions to which terrestrial things are liable. Sometimes health, joy, affluence, and a thousand other blessings concur to render us happy; and we walk, so to speak, in brilliant light. But at the end of a few days, all this splendour disappears, and soon there remains only the sorrowful remembrance of the transitory and fickle blessings we have enjoyed. How earnestly, then, should we long to pass from this uncertain world to a region of felicity, where all the blessings which we shall enjoy shall appear to us the more excellent because they are not subject either to corruption or decay!

## JULY XIV

### MINERAL WATERS.

WHETHER we consider mineral waters as to their formation, or in respect to the innumerable advantages derived from them, they are doubtless a precious gift from heaven. But in this, as in many other cases, we are inattentive and ungrateful. Even the places where these springs of health and life flow in abundance for us, are rarely what they should be—places consecrated to gratitude and to the praise of God. For these and other



blessings, let us hereafter endeavour to be more grateful to our heavenly Benefactor.

In the first place, the sources whence we draw the common salt which seasons our food, deserve our attention. It is probable that these sources derive their origin from that mineral salt, which the waters dissolve under the earth. The mineral hot baths are not less remarkable. They are not only so very numerous, that in Germany itself nearly 120 are reckoned, but the waters of them are so hot that they must stand to cool twelve, and sometimes eighteen hours, before they are fit to bathe in. Whence can this extraordinary heat proceed? It is certainly not from the sun: were it occasioned by his influence, the water would retain its warmth only during the day, while it was subject to the action of the sun; and would of course cool at night, and be cold during the winter. Nor can this heat, with any more likelihood, be attributed to subterranean fires; for still we should have to account for the medicinal virtues of these waters. Perhaps the most simple cause that has been assigned is, that the waters, passing through earth strongly impregnated with sulphureous, pyritous, and metallic substances, acquire this degree of heat. When the water falls into these quarries, the sulphureous and ferruginous particles, which it dissolves, take fire by the friction and reaction of their principles, and communicate that heat to the water which runs over them.

But there are various substances which evolve heat when they unite chemically with water, or with each other. We need not go farther in quest of the heat of some mineral springs, than that which is contained in water itself, and also in the substances which combine with it. Thus cold water, and cold concentrated sulphuric acid, mixed in nearly equal proportions, produce an almost boiling heat.

Medicinal waters, and particularly those which are acidulated, are produced by dissolving and mixing with those mineral substances which they wash away. They are found especially in those places where there is an abundance of iron, copper, sulphur, and pitcoal. Hence it is that their taste and effects are so different, in pro-

portion as they are more or less impregnated with the above principles. They are bitter when they spring through bitter roots, impure resin, nitre, or copper. They are cold when they proceed from rocks, or when they are impregnated with sal ammoniac, nitre, alum, &c. Fatty and bituminous substances render them oily. Sulphur mixed with acids renders them sulphureous in taste and smell.

Let us admire the inexhaustible riches of that divine goodness, which has prepared for men wholesome fountains, which never grow dry. Mineral waters may doubtless have other uses ; but it is incontrovertible, that they were formed for the health and preservation of men. It is for man that the Lord has caused these beneficent waters to spring out of the earth : let us therefore acknowledge his goodness, and feel deeply affected by it. Let those especially, who have experienced their strengthening and salutary virtue, be deeply penetrated with gratitude and love to their heavenly Father. Let such glorify him by imitating his example, causing their riches to become springs of life and consolation to their necessitous brethren.

## JULY XV.

### THE CONTINUAL ACTIVITY OF NATURE IN THE VEGETABLE KINGDOM.

WHOEVER wishes to know why nature is never idle during the whole course of the year, need only reflect on the innumerable advantages which result from this constant activity. The vegetable kingdom was designed for the use of men and animals. Men receive both food and pleasure from it ; animals receive food only. The beneficent Creator purposed to procure men both nourishment and comfort ; this is the reason why he has commanded nature not to produce all sorts of plants at once, but successively. In reality, if they all appeared at the same time, none of the ends already mentioned could be accomplished. How could men find time to get in their different crops, if all should come to maturity at

the same time? How could they all be preserved, seeing there are many of them whose duration is very short, and which would speedily lose both their taste and virtue? What then would become of the pleasing sensations which they procure both to our eye and to our palate? What flavour would cherries and other summer fruits have, were we to eat them in the midst of winter, encompassed with snow and ice? Would not the wine itself be changed into vinegar, were the grapes to ripen in the height of summer? And what would be the lot of so many millions of animals, over whose preservation the Divine Being watches, as well as over that of men? How could they live, if all the productions of the earth came to their maturity at the same time?

There are a hundred species of insects which are nourished only by flowers; how could they exist if the flowers lasted only one or two months? Could they collect enough to have always sufficient food? It is true, that the greater part of insects find none in winter; but they are so constituted, that at the time when their provisions fail, they fall into a deep sleep, and so they require none. This could not take place in summer, because the heat would awake them. It is therefore certain, that if nature were otherwise arranged, men as well as other animals would suffer much, if not be destroyed by hunger; and we have good ground to assert, that the support of men and beasts is one of the principal ends which the Author of nature has proposed in establishing such a continual activity in the vegetable kingdom.

If we next reflect on the pleasures of sight and smelling, which God designed for men, we shall find that in this respect also it is necessary that nature should be constituted as remarked above. It was not only necessary that she should bring forth her flowers in all their beauty, but that she should do this through the whole year for the continual enjoyment of men. In spring, when men walk out into the fields, to contemplate the different substances which the Creator causes to spring forth for their nourishment, they see the trees blossom in all their beauty. Towards summer, when they are

principally occupied with their corn, a thousand beautiful flowers present themselves to their sight. They show themselves successively, and replace each other during the whole of that season, in which men can enjoy this pleasure. Lastly, when the cold of winter takes place, and we shut ourselves up in our houses, nature produces other vegetables which, though not very pleasing to the sight, have yet many and considerable advantages. From all this it appears that the pleasure and comfort of man are some of the great ends which God has proposed in that arrangement of nature which we have already described.

Such is the plan by which the Creator has disposed the vegetable kingdom. All is so regulated that men and animals may find sufficient nourishment; and also that the former may find as many pleasures and comforts as possible. In consequence of this law, certain plants produce their flowers and fruits in spring, others in summer, and others in autumn or in winter. Thus, each has its appointed time, and appears precisely when it may be of the greatest utility. Scarcely have the first accomplished their service, when the others begin to appear in all their beauty. We see many thousands of plants, and all follow the same law.

In this wise and regular order, all the things which God has created are found, although the weakness of our understanding prevents us sometimes from discovering their uses and designs. Let us therefore bless our Creator, give him glory in all things, and acknowledge that, in all the revolutions which take place in the vegetable kingdom, God proposes always our comfort and happiness. With what gratitude should such reflections inspire us! And what sweet satisfaction should we feel as often as we contemplate the beauties of nature in our fields and in our gardens!

## JULY XVI.

## THE BEAUTY AND UTILITY OF MEADOWS AND FIELDS.

THE sight of a large and beautiful garden, in these summer days, affords us a sensible pleasure which we find not in our houses, and of which we cannot, while confined to them, form even a just idea. But the pleasure which the most regular gardens affords, is not comparable to what we feel, when we walk in the meadows and fields. The stately tulip, the elegant narcissus, the beautiful hyacinth, do not afford so much pleasure as the simple flowers which enamel a fertile valley. Whatever charms the flowers cultivated in our gardens may have, those of the fields and meadows are still more pleasing. In the former we observe beauty, but the latter unite both beauty and utility. Is it not true that in these long, uniform, and well-gravelled walks, those bowers, thickets, and parterres, so gay and well-proportioned—is it not true, that we find ourselves confined and hampered in them? Every place which confines our sight appears to set bounds to our liberty. We aspire to walk at large in the extensive fields and meadows; and we seem to become in a certain measure independent, and more at liberty, in proportion as our walk widens and extends before us.

In the country in summer, fertile and beauteous nature varies her appearance every moment; whereas in our gardens, so well ornamented, we always see the same objects. Even their order, proportion, and regularity prevent us from being long pleased with them. In a short time we perceive no novelty in, and begin even to tire of them. On the contrary, the eye wanders with delight over objects continually varied, and which extend themselves beyond even the reach of sight. To afford us this satisfaction, the Author of nature has ordained that in most places the earth should be smooth and even; but that we might have distant agreeable prospects, he has encompassed our horizon with rising hills. He has done more still, he has spared us the trouble of cultivating

and watering these flowery gardens. In them he has sowed an innumerable multitude of seeds, from which a verdure is derived which scarcely ever fades, or if faded a little, is speedily renewed.

The prodigious multitude of plants which cover a field, are not for the sight only; each has its particular leaves, flowers, virtues, and beauties. It is true, that the same species of herbs is prodigiously multiplied in each field; but we scarcely take a step without passing over a hundred different kinds, each of which has its particular structure and use. This is one of the principal reflections which we should make at the sight of the fields. To the pleasure which this sight affords, our beneficent Creator has joined the most considerable advantages. The fields not only produce plants for our nourishment, but also innumerable simples, useful in medicine. But the greatest good afforded to us by the fields is, that they nourish almost without expense those animals which are so essentially necessary for us. The ox, whose flesh is our food, and by whose labour our grounds are cultivated, has no other food than the produce of the field. The horse, whose services are innumerable, asks only, as a recompence for his labour, the free use of the field, or a sufficient quantity of hay. The cow, whose milk is one of the greatest supports of life, requires nothing more. The pasture ground is the most perfect of all heritages; it is preferable even to cultivated fields; for the produce of the former is ever sure, and it neither requires seed nor labour, it requires only the small trouble of collecting that which it produces. Its productions are not casual, for it rarely happens that the pastures are ravaged either by drought or inundations.

But it is a melancholy thing that men, who are in general so inattentive to and insensible of the blessings of God, should be equally so in reference to this. We look upon grass commonly with contempt or indifference, probably because it grows under our feet, and requires no cultivation, and we do not consider the pastures to be of immediate use to us. But whatever the cause of our indifference may be, it is certainly without excuse. Would to God, that when we walk in the fields and

plains, we had a sensible and grateful heart ! That at the sight of meadows, enamelled with flowers, we might be deeply affected with the goodness of the Most High, who opens his liberal hand over all the earth, and abundantly satisfies the desires of both men and beasts ! O that we were deeply convinced that his goodness is everywhere, and that there is not a corner of the earth where he does not manifest the footsteps of his kind providence ! Yes, all countries, all soils, the good and the bad, the sandy and the marshy, the stony and the moist, announce the beneficence of the Preserver of all things. The whole earth is one immense pasture, where all living creatures may find nourishment, pleasure, and delight.

May we never hereafter consider these pasture-grounds but with sentiments of gratitude and joy ! While we sit on a flowery bank, and cast our eyes around, may we be penetrated with gratitude and joy, and raise ourselves to thee, our affectionate Father, in songs of thanksgiving, and proclaim thy benefits ! “How lovely and delightful are these flowers, which encompass me by thousands ! Could Adam, in the terrestrial paradise, behold any more delightful than these ? Here, troops of winged songsters celebrate the Lord of the universe ; there, the verdant fields, and the flowers with which they are enamelled ; farther off, the thickets and forests announce the goodness of the Parent of nature, and proclaim his unlimited munificence.”

## JULY XVII.

### THE MORNING TWILIGHT.

It cannot be doubted, that this phenomenon which we daily behold, is equally with others designed for the benefit of the world. Twilight is no other than a prolongation of the day, which prepares our eyes sometimes to bear all the splendour of the rising sun, and at other times to support the approaches of the night. The twilight is not always the same ; it varies according to different climates and seasons. It continues longer at

the poles than in the torrid zone. The inhabitants of that zone see the sun rise directly above the horizon, and sink in the same direction under the lower hemisphere, so that he leaves them suddenly in the most profound night. On the contrary, the sun darting his rays obliquely towards the poles, and not sinking much below the horizon of the neighbouring people, their nights, though long, are almost constantly attended with twilight, and therefore in some measure luminous. It is a happiness for the former to have scarcely any twilight, and it is not less so to the others to have an almost uninterrupted dawn.

As for us, who are placed nearly at an almost equal distance from the inhabitants of the torrid and frigid zones, we plainly observe that our twilight becomes shorter in proportion as our days shorten; and that it increases in proportion as the days lengthen. In the evening we enjoy an hour of twilight, and sometimes more, after the sun sets. Previous to his rising we have a twilight of the same length. This arrangement, so useful, we owe to the properties which God has given the air. He has encompassed the earth with an atmosphere which extends very high; he has made such a proportion between the air and the light which pervades it, that when the rays enter it perpendicularly, nothing disturbs their direction; but when a ray enters obliquely or sideways, instead of passing through it in a direct line, it is bent downwards, so that the greater part of the rays which fall down into the atmosphere, close to the earth, by this inflection, fall back upon it. For instead of pursuing their direct course in passing by the earth, they are reflected by the air; thus, when the sun approaches our horizon, many of his rays which pass by us, and are not sent directly to us, meeting with the mass of air which surrounds our globe, are bent in that mass, and sent back to our eyes, so that we have day-light some time before the sun himself appears. We have twilight long before the sun rises, by the reflection of his rays which fall on the atmosphere, and day-light three or four minutes before, by the refraction of the same rays.

This law of the refraction and reflection of light in the



mass of air which surrounds us, is a work equally full of wisdom and goodness towards all the inhabitants of the earth ; but, it is an especial blessing to those who dwell in the frigid zones. Without the assistance of twilight they must be for several months plunged in the deepest darkness. It is possible, that this explanation of the origin of twilight may not be altogether intelligible to some readers ; however, let us leave further details concerning this phenomenon to philosophers, and let us content ourselves with considering it as Christians and reasonable beings should. To consider it profitably, we need no more intelligence than what ordinarily falls to the share of a common labourer, provided the heart be right with God, and earnestly desires to glorify its Creator. The simple though unlearned Christian is often wiser than the most eminent philosophers, who, while they calculate and explain the twilight, lose sight of that Supreme Being who gives to man the light of the day.

The simple Christian, falling on his knees at the arrival of the twilight, may be led thus to adore his Creator. Father of the day, and Author of twilight ! I exalt and bless thee at the sight of the first and last rays of the sun. With what tender care dost thou watch over the welfare of men ! Were I a labourer, I could, after having endured the intense heat of the sun, profit by the twilight to cut down my crops in the cool of the night. I should probably praise thee with more gratitude. Were I a traveller, how pleasing must the morning twilight be to me ! Probably, while walking in its mild influence, I should bless him who has formed it ; while, on the contrary, at present I pay too little attention to this blessing, and seldom think of praising thee for it. How cool and delightful are the summer mornings ! If there were no sun, no atmosphere—if thou, O Creator of the sun and atmosphere, didst not exist, I should not desire to live. What am I saying ? If thou wert not, I could have no being. I praise thee for thy being, and rejoice in my own ; and bless thee that there is a world which thy beneficent hands have formed, and which thou hast condescended to enrich with so many beauties.

## JULY XVIII.

## THE PLEASURES OF THE COUNTRY.

COME, and let us enjoy those pleasures which are relished only by the wise. The pleasing light of the sun invites us to the field. There the purest pleasure awaits us. Let us walk into a flowery valley, and sing a hymn of praise to the Creator.

How gently do the zephyrs breathe through every branch and leaf of these bushes! Everything before us bounds with joy, or resounds with songs of gladness; all seem invigorated, and animated with new life.

How do the ruffled woods, the vallies, and the mountains, which the summer has adorned by its gifts, delight the eye, and rejoice the heart! Their charms are not the produce of art; even the ornamented gardens are eclipsed by them.

The corn grows yellow, and begins to invite the reaper to prepare his sickle. The trees, crowned with leaves, spread their shade over the little hills and fields. The birds rejoice in their existence, and sing their pleasures; their notes express nothing but joy and affection.

Each year renews the treasures of the peaceable husbandman; freedom, and a consciousness of his happiness, shine in his serene countenance. Neither hateful calumny, nor pride, nor the corroding cares by which the inhabitants of cities are enslaved, disturb the repose of his mornings, nor vex him with sleepless nights.

No place can prevent the wise man, who delights to exercise his senses and reason, from relishing the pleasures which are found in the bosom of the country. There, the rich pastures, the meadows covered with dew, the beautiful pictures which every part of nature presents, fill his soul with sweet delight, and elevate his heart to his Creator.

## THE EVENING TWILIGHT.

THE evening twilight is that faint light which, after sunset, continues still to illuminate our atmosphere, particularly towards the west. It is partly occasioned by the refraction and reflection of the rays of the sun in our atmosphere; and partly by the atmosphere of the sun itself, known by the name of the zodiacal light, which sometimes appears, but particularly in spring, towards evening; and in autumn, towards morning. When the sky is clear, we may see the smallest stars during the twilight; though not in the very brightest part of it. It continues from the time that the sun has entirely disappeared till dark night; and its duration is ordinarily about two hours. In the island of Senegal, where the nights and days are almost always equal, the twilight lasts but a few moments. The interval between sunset and dark night, is scarcely a quarter of an hour. Thus, as soon as the sun is ten or fifteen degrees below the horizon, darkness is spread over the whole country, and it becomes like midnight.

About the 1st of March, and the 11th of October, our twilight is the shortest. When the northern declination of the sun and the latitude of the place are such that the sun does not descend more than eighteen degrees below the horizon, the twilight then lasts the whole night. It is on this account that in these countries in the summer solstice we have scarcely any night; and that, in the more northern climates, there is no night at all, although the sun is below the horizon. This takes place when the difference between the depression of the equator, or complement of latitude, and the northern declination of the sun is less than eighteen degrees. This happens in the greater part of Germany from the 17th of May to the 25th of July.

The advantages which we and many other creatures derive from the twilight are very evident. To pass immediately from the broad day to dark night would be very inconvenient. So sudden a passage from light to darkness would wound, if not destroy, the organs of

sight. Travellers overtaken by so sudden a night must lose their way, and the greater part of birds be in danger of perishing. The wise Author of Nature has prevented all these inconveniences, by giving our earth an atmosphere which hinders us from losing the light suddenly, although the sun is below the horizon. And thus, through the medium of the twilight, we pass, by insensible degrees, from day to night.

## JULY XIX.

### THE EPHEMERON FLY.

THIS insect is named ephemeron (i. e., half a day), because of the short duration of its life in the state of a fly. It is one of the most beautiful species of the small flies. It undergoes five transformations. First, the egg contains the principles of its life ; secondly, a caterpillar proceeds from the egg ; thirdly, this is transformed into a chrysalis ; fourthly, the chrysalis becomes a nympha ; and fifthly, this ends in a fly. This fly lays her eggs on the water, where the heat of the sun hatches them. A very small red worm comes out of each egg, which has a serpentine motion. They are found in abundance in ponds and marshes during the whole summer. But as soon as the water begins to be cold, the worm makes itself a little sheath, in which it passes the winter. Towards the end of winter it ceases to be a worm, and enters into its third state, that of a chrysalis. In this state it sleeps during the spring, and by degrees becomes a beautiful nympha, or kind of mummy, something in the form of a fish.

On the day appointed for its metamorphosis, it appears stupid and inactive : in about six hours the head makes its appearance, and rises by degrees above the surface of the water. Afterwards the body disengages itself slowly ; till at length the whole animal comes out of its sheath. The new-born fly falls on the water, and remains some minutes without motion. In a short time it begins to revive, and moves its wings feebly. Finally, it moves them quickly, and tries first to walk, and then to fly.

As these flies are all hatched nearly in the same moment, they are seen in swarms, jumping and playing on the surface of the water for the space of two hours. The male and the female then seek each other, and unite for the space of two hours more. Then they begin again to skip and play, lay their eggs, and shortly after fall down and die. Thus they terminate their short life in about five or six hours ; and never survive the day in which they were born.

Let the history of the life of these animals teach us how false the opinions are which we form of our lives in reference to eternity. Suppose that one of these flies had preserved its active and laborious life for twelve hours, and thus arrived at the most advanced age, relative to its companions, the greater part of which died at noon. If this very aged insect could speak, probably about sunset, a little before its death, it would thus address its assembled friends : " I now find that the longest life must end. The term of mine is arrived, and I regret it not ; for old age is already become my burden, and I can no longer discover anything new under the sun. All that I have seen during the course of my long life has convinced me that there is nothing here certain or durable. A whole generation of our species has been destroyed by a violent tempest. The coolness of the air has carried off a great number of our sprightly youth. I have lived in the first ages of the world ; I have conversed a great deal with insects, much more respectable, robust, and intelligent than any of the present generation. I can assure you, that the sun which appears now not far distant from the earth, I have seen in the midst of the sky. In those ancient times its light was more vivid than it now is, and our ancestors were more sober and virtuous than we are. I have seen many things, I have had long experience, and I have outlived all my contemporaries. My life began precisely when that sun arose ; during countless years it ran its majestic course in heaven, and diffused the most intense heat everywhere ; but now that it is on the decline, and is going to set, I plainly foresee that the end of all things is at hand. O my friends, how much did I once flatter myself that my life should be eternal ! How beautiful were the cells

which I formed for my abode ! What hopes did I build on my good constitution, my vigour, agility, and the strength of my wings ! But, after all, I have lived long enough, and none of those which I leave behind will ever run so long and so delightful a course as mine."

Thus might an insect speak which has lived on the earth nearly twelve hours. But might not a man who has spent fourscore years in the world, use nearly the same language ? Truly, the difference between fourscore years and twelve hours is nothing in reference to eternity. And in general, do we employ our fourscore years to a much better purpose than this ephemeron fly is stated to have employed its twelve hours ?

## JULY XX.

### NOTHING PERISHES IN NATURE.

WERE there anything in the world which perished without any good resulting from it, we might well doubt the wisdom of the Divine government. But we have reason to believe that in the immense circle of creation, not even the smallest grain of dust has ever perished, but that all things exist for certain purposes, each accomplishing in its own way the end for which it was designed.

The seed which drops off a flower is not destroyed ; it is often carried away by the winds to make other flowers fruitful ; or else it takes root in the earth, and becomes a plant. Other seeds and fruits are devoured by birds and beasts ; they are digested, and mixed with their juices ; part goes for manure to the land, the rest nourishes those bodies which are to become food for man and other animals. Certain things corrupt, and become decomposed, it is true ; but by this they become parts of some other substance, and serve, under a new form, to accomplish ends for which they were not proper in their first estate ; for in order to answer these ends it was necessary that they should be prepared by different changes, and by a reunion with other substances.

The butterfly could never have produced its like had

it not been a caterpillar. No animal whatever, as we now see it, could have ever been produced if its germ had not pre-existed in the first animal of its species. Nothing perishes in nature ; things are only decomposed in order to appear under a new form, and become part of some other substance. Every grain of dust is, so to speak, the germ of new creatures, and holds its proper place in that chain of beings which have been produced for the perfection of the whole. If you take a handful of the sand you tread on, you perhaps take away the lives of millions of insects which were the inhabitants of this sand. Did we know properly the elementary particles of matter, we might be better able to determine what the other substances were in which they, so to speak, lay concealed, and into the compositions of which they entered.

“But may not abortions, or children which die immediately after they are born, be considered as creatures which perish without being of any use?” No, certainly. They fulfil, in their way, the designs of the Creator, and are prepared by different revolutions for their future state. Nature does everything gradually. Man is first an infant ; and the tree a twig. Each creature employs its energy during its short duration, and prepares itself for a new state. The step which man must take to pass from the mere sensitive life of childhood to the rational life of advanced age, is certainly not greater than that which the infant takes from its mother’s womb to the sensitive life. And we can no more say that the infant has not fulfilled the design for which God created it, than we can that the full-grown man has not accomplished those purposes of his Maker here below, which he is not to fulfil till he become an inhabitant of heaven. Every creature answers the end of its formation, in a particular way, and according to its faculties. Like the wheels of a watch, some go fast, others go slow ; but all tend, directly or indirectly, to the end of their formation. All things develope and exercise their energies ; and contribute something, according to their power, to the execution of the general plan which God has laid down.

We may meet with many things in nature which at first sight may appear useless ; and consequently may

seem to have been produced without design. We may think that others have been entirely destroyed and annihilated. But let us not be too precipitate in our judgments; and let us not be too hasty to find fault with the ways of the Lord. Let us rather believe that whatever we see, however strange and unconnected it may appear, is arranged in the wisest manner; and that God knows how to accomplish his designs, when we, weak and ignorant mortals, cannot form an idea of the ends he proposes.

“Let us be assured that the hand of the Lord has planned everything with the utmost wisdom. Look around; all is connected; everything is in its proper place, and nothing owes its situation to chance. There is not a thing in the world which is useless, even when it falls into dust. Nothing is lost from nature, nothing perishes in it; not even the smallest leaf, nor a grain of sand, nor one of those insects which the naked eye cannot discover; nor any of those seeds which the breeze carries away. The majestic firmament where the sun shines with so much splendour, the dust which sports in his beams, and which we respire without perceiving it; all has appeared at the command of the Creator; all is placed in the most proper situation; all exists never to end; all is good and perfect in the world which the Most High has created. And yet rash and presumptuous man dares to find fault with the works of the Lord!” Let us not resemble these madmen; let us glorify God, and secure our own peace, in believing that of all which has been made, nothing perishes, nothing is useless. Even our bodies perish not; though they wear, and are continually evaporating, and at last shall be entirely decomposed in the grave; though they become constituent parts in a multitude of strange bodies, yet they shall have a resurrection to a life without end.



## JULY XXI.

## DIFFERENCE OF ZONES.

THE Creator having made our earth in a globular form, and having impressed on it a double motion, it necessarily followed that the regions of the earth should differ from each other, not only in the temperature of the seasons, but also in the plants and animals which they produce. In certain countries of our globe there is but one season, viz., summer, which incessantly prevails; and every day there is as hot as our warmest summer days. Those countries are situated on the middle of our globe; and occupy what is commonly termed the torrid zone. Those fruits which are most grateful to the smell and taste are produced there, and grow nowhere else; and in it nature has poured out her richest gifts. In this zone, the days and nights are nearly of an equal length, during the greatest part of the year.

On the other hand, there are countries in which a cold more intense than that of our most rigorous winters prevails during almost the whole year. There are only a few weeks in the year warm enough for the few plants and trees which they have to grow or become green; but in those frigid zones neither the trees nor the ground produce such fruits as are proper for the nourishment of man. In these countries, the greatest inequality prevails between the days and nights; both last in their turn for whole months together.

The two temperate zones, situated between the torrid and frigid zones, occupy the greatest part of our globe. In these countries there are always four seasons, more or less distinctly marked, according as they approach to the torrid, or to one or other of the frigid zones: 1. The spring: in this, trees and plants bud and blossom, the heat is moderate, and the days and nights nearly equal. 2. The summer: in this, the fruits of the trees and fields ripen, the heat is more intense, and the days longer than the nights. 3. The autumn: in this, fruits and seeds fall, the grass becomes withered, the days and nights are equal, and the heat diminishes daily. 4. The winter:

in this, vegetation is almost totally suspended, the nights increase in length, and the cold becomes more intense.

The countries of the temperate zones are so situated that in those which are near one of the sides of the torrid zone, the seasons are diametrically opposed to those of the other temperate zone. When it is winter in one it is summer in the other, &c. In these countries nature seems to have produced the greatest varieties, not only in the productions of the earth, but also in animals. Wine is peculiar to those countries; for the vine cannot be cultivated in very cold or intensely hot countries. Men especially have peculiar advantages in these countries. The inhabitants of the frigid zone are generally stupid and low in stature; those of the torrid zone are of a very weak constitution, have stronger passions, but less physical and intellectual energy, than the inhabitants of the temperate zones.

However diversified the regions of our earth may be, the Creator has provided, by wise arrangements, for the well-being of those who inhabit them. He causes every country to produce what is most necessary, according to the nature of the climate. A worm, which feeds on the leaves of the mulberry-tree, spins for the inhabitants of the torrid zone that silk out of which they form their clothing; and a tree like a shrub bears a kind of husk, or shell, filled with a fine wool (cotton) of which light stuffs are made. On the other hand, cold countries abound in quadrupeds, the skins of which serve for clothing to the inhabitants of the north; and they are also stocked with thick forests, from which they procure wood in great abundance for firing. That the blood of the inhabitants, in a soil naturally hot, may not be too much inflamed, their fields and orchards afford them refreshing fruit, and that in such abundance that they can spare ample provision of this kind to the inhabitants of other countries. In cold countries, God supplies their lack of the fruits of the earth by the vast multitudes of fish which the seas and lakes contain, and by the great number of animals which dwell in the forests; and though they are a subject of terror to men, nevertheless they furnish, not only excellent furs and wholesome food, but also many implements for domestic use.

Thus, there is no region on the globe which does not experience the excellence and goodness of the Most High. There is no country, however poor or barren we may suppose it, where nature does not show herself sufficiently kind, in providing one way or other the necessities and comforts of life for the inhabitants.

In every place, O beneficent Father! thy wisdom and goodness may be traced. Even the impassable deserts, and the rugged mountains, which fill a great part of Asia and Africa, contain monuments of thy wisdom and beneficent love. The countries where the snow and ice cover the earth, as well as the temperate zones, send songs of thanksgiving to thee. Father of Beings! thy name is glorified in all languages. But it is in our climates that thou shouldst be particularly exalted, seeing thou hast favoured us more than so many millions of the other inhabitants of the earth.

## JULY XXII.

### SINGULARITIES OF THE SEA.

IN general, the sea is considered only in a terrible point of view, without reflecting on the wonders and blessings it so visibly presents to us. We cannot, indeed, deny that the sea is a most formidable element, when its waves swell mountain high, and the tempest roars. In such cases vessels are often driven far out of their course, dashed to pieces by the waves, and swallowed up. Sometimes, the storm drives them against sandbanks and rocks, where they are entirely wrecked. Whirlpools, or those masses of water which make the vessel turn rapidly round, and at last swallow it up; these gulfs and whirlpools are occasioned by great cavities in the sea, where rocks and opposite currents meet. No less dangerous are the water-spouts, which the wind lifts from the sea towards the sky. They hover in the air over the sea, and the wind causes them to twist and turn with violence. They often burst with a great crash, and do great damage; for, when they approach a vessel, they mingle with its sails, raise it aloft, and shake it to pieces,

or precipitate it to the bottom : at least, if they do not carry it away, they break the masts, tear the sails, and drown the vessel. Many ships perish by similar causes.

But we should be very ungrateful to pay attention only to the mischief which the sea occasions, without condescending to reflect on the magnificent works of the Lord ; and on that goodness which shines forth even in the depths of the abyss. The first thing worthy of remark is the saltness of the sea. It is such that a pound of sea-water contains two ounces of salt. Sea-salt is lighter than that which we commonly use ; nevertheless it is not attracted by the air, nor is it diminished by the continual influx of fresh water. The cause of this is hidden from us. There may be mountains of salt in the sea ; but if the saltness proceeded from this, would not the water be salter in some places than in others ? but of this there is no certain proof. It is possible that brooks and rivers may bring down salt and nitrous particles into the sea ; but what is this to the vast extent of the ocean ? But, whatever the cause of this saltness may be, it is especially necessary for certain purposes. It is this which preserves the water from putrefaction, and renders it so weighty, that greater burdens may be carried on it from place to place, than can be on fresh water.

The colour of the sea also merits our attention. It is not the same everywhere. In all waters the colour of the sky and of the bottom is seen. Deep waters are black—during a storm they become white and covered with froth : they are silvered, gilded, and shaded with the most beautiful colours, when the rays of the setting sun fall upon them. But, besides all this, different insects, remains of marine plants, with the different substances which the rivers hurry down into the sea, vary its colour still further. When it is calm, it appears sometimes as if strewed with beautiful pearls. Often, as a vessel passes quickly through the waves, the water appears luminous, as if a river of fire followed her. These phenomena should be attributed on one hand to sulphureous and oily particles, and other inflammable marine substances ; and on the other hand to shining insects.

A well-known property of the sea is its flux and re-

flux. Each day, or rather in the space of twenty-five hours, the sea ebbs and flows twice. When the tide rises, it is called the flux or flood; when it falls, it is termed the reflux or ebb. This phenomenon is accompanied with many remarkable circumstances. There are always a flux and reflux in two parts of the earth at the same time; and these two places are opposite to each other: when our antipodes have flood water, we perceive the same with us. The tide is always lowest when we are in the first and last quarter of the moon; and the highest tide takes place generally three days after the new and full moon. Nevertheless, there may be accidental causes why the tides are higher and lower at one time than at another. This phenomenon, long unknown, is now perfectly accounted for on the admission of the laws of attraction, which have been fully explained and established by Sir Isaac Newton. The doctrine of the tides is of great advantage to our globe; because, on the one hand, the flux and reflux tend to purify the sea; and on the other, they favour the purposes of navigation.

But supposing all this, marvellous as it may be, is not sufficient to engage our attention, probably the creatures with which the sea is peopled may excite our admiration and surprise. Here a new world is discovered, and the number of creatures by which it is inhabited is prodigious. Aquatic animals are, it must be granted, not so varied in their species as the terrestrial; but they surpass them in size, and live longer than the inhabitants of the earth and the air. The elephant and the ostrich are small in comparison of the whale. This is the largest fish in the sea; sometimes it is from sixty to seventy feet in length: it is as long-lived as the oak, and consequently no terrestrial animal has so long a life.

If we can credit certain accounts, there are some animals in the sea larger even than the whale. This is a sort of crab, called Kraken, which is said to inhabit the northern seas, and which is half a German mile in circumference! But who can even enumerate the different kinds of animals which people the surface and bottom of the sea? Who can count their number, and describe the form, structure, size, and use of these dif-

ferent animals? How infinite is the grandeur of him who has created the sea!

This is the conclusion which we must naturally draw from such reflections. It is not without the most cogent reasons that the Creator has designed the ocean and seas should occupy two-thirds of our globe. The seas were not only to be great reservoirs of water, but also, by the means of vapours which are raised from them, were to become the source of rain, snow, and similar meteors. What wisdom is discoverable in the connexion the seas have with each other, and in the uninterrupted motion which the Creator has impressed upon them! What is not less worthy our admiration is, that the bottom of the sea is nearly of the same nature with the surface of the earth. There are found in the sea, rocks, vallies, caverns, plains, fountains, rivers, plants, and animals. The isles of the sea are no other than the summits of a long chain of mountains. And when we consider that the sea is a part of our globe which has been less examined than the rest, we have reason to believe that it contains a number of wonders, which neither the senses nor the understanding of man can adequately comprehend; but which all proclaim the wisdom and power of the Most High. Let us adore our Creator, who has everywhere, in the ocean as well as upon the earth, established monuments of his greatness.

## JULY XXIII.

### THE DIFFERENT SHADES OBSERVABLE IN FLOWERS.

WITH a heart full of joy I feel myself in the presence of the Author of all that exists, and endeavour to contemplate his works. I cast my eyes around, and see innumerable beauties. What a lovely assemblage of colours do I behold! How pleasing and diversified is their mixture! With what admirable art are those shades distributed! There, a light pencil seems to have laid on the colours; here, they are blended according to the nicest rules of art. The colour of the ground is always such as best serves to relieve the drapery; while

the green which surrounds the flower, or the shade which the leaves cast upon it, serves to set off the whole.

In thus distributing and diversifying the colours, the good God seems to have had nothing else in view but to afford us agreeable sensations. How great and wisely arranged are all the works of the Lord! We may well admire the grandeur of the ends which he has proposed, and still more the wisdom of the means which he has employed to accomplish those ends. It is with difficulty that men succeed even in a single work: after many efforts, several of which are superfluous, we sometimes happen to succeed in a tolerable imitation of some one of the works of nature. But the Supreme Power has, in a moment, given existence to millions of beings, and has created them all in a state of perfection. The more we examine the works of art, the more defective they appear. But, though men have been examining the works of God for nearly 6000 years, they have never been able to discover a single defect in the plan; nor can they imagine anything which could further perfect the execution of it. The more we examine his works, the more we are astonished at their beauty; and we always discover new marks of grandeur in these masterpieces of the divine hand.

For my part, what fills me most with admiration in the shades and tints of flowers, is the simplicity of this beautiful work. We might suppose that the Creator must have employed an infinity of materials thus to embellish nature, and distribute to flowers and plants so many magnificent, rich, and splendid colours. But God has no need of painful preparations to make the creation a theatre of wonders. A single element in his hand assumes the most beautiful and varied forms. The moisture of the earth and air insinuates itself into the tubes of plants, and is filtered through a series of transparent pipes. This is what works all these wonders, and produces all the beauties which we perceive in the vegetable kingdom. This is the sole cause of the beauty, life, and odour of flowers. If each colour had its particular cause, the admiration of the spectator would be diminished: but we contemplate with pleasure, and are never weary of admiring as an effect of the divine wisdom, a work

which, diversified in its parts, is nevertheless simple with respect to its cause; and in which we see a multitude of effects depending on a single spring, that always acts in the same manner.

At this moment, while we examine the diversity of tints which colour the flowers, we may feel more than ever the value of that reason with which we are endued. Without this faculty, we should be deprived of all the pleasures which the sight of these flowers affords us, and their existence in respect to us would be useless. But by the assistance of this faculty, we are capable of discerning the innumerable beauties of flowers, the infinitely varied blending of their colours, and the amazingly diversified shades which the meadows, vallies, mountains, and forests present. Through this faculty, we not only can discern them, but so appreciate their beauties as to cause them to contribute to our pleasures. We have farther advantage still; we can make each flower lead us to the Creator: in each, we may see the traces of his perfections, and make their various hues an occasion to glorify his holy name.

O our God and Father! how can we sufficiently adore thee for the inestimable gift of reason! It is right that at the sight of thy works we should bless thee, for the faculty thou hast granted us to know their beauty, and to be able to enjoy them. Without this faculty, what should we be, and what would the world be to us!

## JULY XXIV

### THE GREAT HEATS OF SUMMER.

ABOUT this time we ordinarily experience the greatest heats. Probably it will appear extraordinary to some to hear that the sun, which now enters Leo, removes every day farther from us. When we were nearer this luminary, the heat was moderate; and now that we are at a greater distance from him, the heat is intense. But does this phenomenon accord with the laws of nature? Certainly; and it is in the constitution of our globe that we must learn the cause. Lately the sun was nearer to



us ; but as his rays were not sufficiently strong to penetrate deep into the earth, we had only a moderate heat : nevertheless, in the space of a few weeks the earth and the bodies upon it are so far heated, that even a less degree of action from the sun produces a greater effect than at the beginning of the summer, when he acted upon cold bodies.

This plan of nature displeases many. We hear them complaining of that burning heat which enfeebles their bodies, and renders them incapable of pursuing their business. But is it not very unreasonable to murmur against a plan, which, being formed on the immutable laws of nature, is therefore inevitable ? Is it not a want of gratitude to our heavenly Father, which causes us to find fault with his government, which in the end never fails to promote the welfare of the world ? And can any one seriously wish the season to be less hot ? What ! because the heat incommodes us, would we desire that so many fruits, which, during the winter, are to be our support, should not come to maturity ? I repeat it, our murmurs prove our ingratitude to our Creator, who ever softens and compensates all inconveniences by certain advantages connected with them. For instance, the inhabitants of the western parts of Africa, particularly those of Cape Verd, and the island of Goree, are exposed, during the whole year, to the most intense heat of the sun ; but their bodies are so constituted that their health is not in the least impaired by it ; and the winds which blow continually in these countries serve to temper and cool the air.

And has the Creator manifested less love to us ? How unpardonable should we be, were we insensible of the proofs which he gives us of his kindness, even when the heat is most oppressive ! Is it not a proof of his tender care, that the summer nights are so well calculated to cool the air ? Night brings with it a coolness which prevents the dilatation of the air ; and, by compressing it, renders it more capable of acting powerfully on bodies. A single night revives the drooping plants, gives a new vigour to enfeebled animals, and refreshes us so that we forget the labour and fatigue of the day. Storms, also, which spread so much terror, are, in the hands of the

Creator, means of moderating and cooling the heat of the air. And how many fruits have we which possess the property of cooling the heat of the blood, and correcting the acrimony of the bile! These are succours the more precious, because the poorest among us may enjoy them.

Let us cease, then, to complain of the heat of the sun, or the load of suffering under which we languish: both belong to the plan of Divine wisdom; both are assuaged by a thousand means, and should excite us to render to the Sovereign of the world, and the Arbiter of our lot, homage, honour, glory, and thanksgiving.

## JULY XXV

### DIFFERENT INSTINCTS AND REMARKABLE PROPERTIES IN ANIMALS.

OF all parts of nature, the animal kingdom presents us with most wonders; and to a lover of natural history, the different properties and different instincts of animals are a most interesting study. But to a reflecting mind, it is something more than merely an agreeable object; and the operations of animals induce him to trace them back to that wisdom which cannot be fathomed, because it surpasses all human conceptions. Let this effect be produced in us, whilst we notice the singularities observable in certain animals.

The manner in which birds and insects lay their eggs is worthy of admiration. The grasshopper, the lizard, the tortoise, and the crocodile take no care either of their eggs or young. They lay their eggs on the ground, and leave the care of hatching them to the sun. Other species of animals, by natural instinct, lay their eggs in those places where the young ones, the moment they come out of the shell, find a sufficiency of nourishment. The mothers are never mistaken. The butterfly, which proceeds from the cabbage-caterpillar, never lays her eggs upon flesh; and the fly, which feeds upon flesh, never lays hers on the cabbage. Some animals have so much solicitude for their eggs, that they carry them

whithersoever they go. The spider, called the wanderer, carries hers in a little silken bag. When they are hatched, they arrange themselves in a particular order on the back of their mother, who carries this burden about with her, and continues for some time to take care of them. Certain flies lay their eggs in the bodies of living insects, and sometimes in their nests. It is well known, that there is not a plant which does not serve both to feed and lodge many insects. A fly pierces an oak-leaf, and lays an egg in the hole which she has made; this wound quickly closes; the place swells up, and there appears an excrescence on the leaf, commonly called a gall. The egg that was enclosed in this growing gall grows with it; and the insect which proceeds from it finds, as soon as it is born, both a habitation and nourishment.

The care which animals take of their young is almost incredible; and their love for them is often greater than for their own lives. With what tenderness do the quadrupeds nourish their young! They cure their wounds by licking them; they carry them from place to place, when any danger threatens; they keep them near to themselves, defend and guide them. If they are carnivorous animals, what pains does the dam take to get them a morsel of flesh! With what art does she instruct them to pursue their prey, to divert themselves with it when they have taken it, and, lastly, to tear it in pieces! It is impossible to read, without being affected, the account of a bitch, who, while they were dissecting her, continued to lick her whelps, as if she sought, in this maternal care, some relief to her own sufferings, and set up a lamentable cry the instant they took them away from her. Certain sea-animals, during a storm, hide their young in their bellies, and then let them out when the tempest is over.

Each species of animals has its peculiar inclinations and wants; and the Creator provides for both. Let us, for example, consider the creatures which are obliged to seek their nourishment in the water; and particularly aquatic birds. Nature has coated over their feathers with a kind of gummy oil, through which the water cannot penetrate; by this means they are never wet in

diving, which would render them incapable of flying. The proportions of their bodies are different, also, from those of other birds. Their legs are placed more behind, that they may stand upright in the water, and extend their wings above it. That they may be able to swim, their feet are provided with webs, which, connecting the toes, serve them as oars. That they may readily dive, nature has given their bodies a peculiar construction ; and that they may the more readily seize their prey, they have a large beak and a long neck. In a word, they are formed exactly in that way which their mode of living requires.

The nautilus is a kind of shell-fish, nearly resembling the shell-snail. When it wishes to arise, it places itself on the forepart of its shell ; and to render it light, it expels the water by a little opening. When it desires to descend, it withdraws itself into the bottom of its shell ; which, filling with water, becomes heavy and sinks. If it wishes to sail, it artfully turns its shell, which becomes a little gondola ; and then it spreads a thin membrane to the wind, which serves for a sail. Possibly, it was from the nautilus that men first learned the art of navigation.

It is the same with the actions of animals as with their make. The same wisdom which has formed their bodies has arranged their members, and assigned them a common use ; it has also regulated the different actions which we see them perform, and directs them to that end which he has proposed in their creation. The brute is led to this by the invisible hand of its Creator ; it performs perfect works, which excite our admiration, and appears to act by reason. It stops, when necessary ; regulates its works according to circumstances ; and yet, perhaps, only follows the impulse of certain hidden springs which make it move. It is as an instrument, which cannot judge of the work it has executed ; but it is directed by the adorable wisdom of our Creator, who has circumscribed every insect, as well as every plant, within a sphere from which it cannot depart. When, therefore, we notice the different instinct and industry of animals, we should feel the spirit of veneration, and acknowledge we behold a scene where the almighty

Operator hides himself behind a curtain. But he who contemplates the works of nature with seriousness will discover the hand of God everywhere; and an examination of the wonderful structure of created beings cannot fail to fill him with gratitude to, and reverence for, the Creator.

## JULY XXVI.

### THE HUMAN FACE.

THE exterior of the human body already proclaims man's superiority over every living creature. His face, directed towards heaven, announces this dignity, which is in a certain sense impressed on all his features; so that we may in some measure judge from the countenance of man what his dignity and destination are.

While the soul enjoys uninterrupted tranquillity, the features remain in a calm and composed state; but when it is agitated with disorderly passions, the countenance becomes a living picture, where the passions are painted with as much energy as delicacy. Every affection of the soul has its peculiar expression; and every change in the countenance is the true characteristic of the most secret emotions of the heart. The eye, in particular, expresses them so visibly, that it is impossible to mistake it; it is more particularly the immediate organ of the soul than all the other organs of sense. The most tumultuous passions and the gentlest affections are painted with the greatest exactness in this mirror. The eye, therefore, may be termed the true interpreter of the mind, and the organ of the human intellect. The colour of the eyes, and their quick or slow motion, contribute much to characterize the physiognomy. Our eyes are proportionably nearer to each other than they are in any other living creature. The space which separates them in most animals is so great, that it is impossible for them to see the same object with both eyes at once, unless it be at a very great distance.

The eyebrows, together with the eyes, contribute most to the formation of the countenance. These parts

being of a widely different nature from the rest, their particular colour renders them more striking than the rest of the features. The eyebrows are the shade of the picture, which exhibits the drapery and colours. When the eyelashes are long and thick, they contribute much to render the eye more beautiful, and the look more pleasing. There are no creatures, except men and monkeys, which have both the eyelids adorned with eyelashes. Other animals have none on the lower eyelid; and in man the upper eyelid has more than the lower. The eyebrows have only two sorts of motions, which they perform by the assistance of the muscles of the forehead. By the assistance of one they are raised; by means of another, they are depressed.

The eyelids guard the eye, and prevent the cornea from becoming too dry. The upper one can raise and depress itself; the lower has little motion. Although we can move our eyelids when we please, yet, when grown heavy with sleep, it is impossible for us to keep them open.

The forehead is the most important part of the face, and one of those which contributes most to its beauty. In order to this, it must have a proper proportion; neither too full nor too flat, too great nor too small, and the hair properly planted on it, so as to form its outline and ornament.

The nose is that part of the face which projects most, and has the least motion. Indeed, it has scarcely any, except in violent passions. It serves more for the beauty of the whole, than for anything that it expresses by itself.

The mouth and the lips are, on the contrary, capable of many changes; and, next to the eyes, the mouth expresses the passions best, by the various forms it assumes. The tongue serves also to animate and set it in play. The redness of the lips and the whiteness of the teeth add to the charms of the face.

Hitherto we have only examined the human face relatively to the regularity and beauty of its component parts, without attempting to explain the different purposes and uses of these parts. But even under this one point of view, we may discover the infinite wisdom of

Operator hides himself behind a curtain. But he who contemplates the works of nature with seriousness will discover the hand of God everywhere ; and an examination of the wonderful structure of created beings cannot fail to fill him with gratitude to, and reverence for, the Creator.

## JULY XXVI.

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Him who, in all his works, takes care to unite beauty and utility. We, whose admiration is so often excited by the beauty which shines in our fellow-creatures, ought to sanctify that admiration, and even increase it, by reflecting on Him whose wisdom and goodness are so conspicuous in the human frame. When we consider our face, it would be well to meditate in silence on the prerogatives which the Creator, in forming our features, has given us over all other living creatures. It would be well, also, to consider the great ends for which man was formed ; concerning which, even the features of his face may help to instruct him. His features were given him for the most noble purposes ; purposes which the brute creation cannot fulfil. Our eyes were formed that they might take the most delightful prospect of the works of God ; our mouth should sing the praises of our adorable Creator. In a word, all the features of our face should bear testimony to the uprightness of our hearts, and the rectitude of our sentiments.

Finally, the ravages which sickness and death make on the face should prevent us from being proud of our accomplishments. This last consideration should lead us to meditate on the happiness which shall follow the resurrection of the just, whose bodies shall be transformed, embellished, and rendered capable of enjoying all the happiness of an eternal glory.

## JULY XXVII.

### ON THE GRAVITY OF BODIES.

God has endowed bodies with a force which acts at all times, in all places, and in all directions. If a body endeavours to move towards one point, more particularly than towards another, it is said to gravitate to that point. For experience teaches us that bodies tend downwards ; if they be at a distance from the surface of the earth, they will, if unsupported, fall down in a straight line. It is by no means in the body itself that we must seek the cause of its gravity ; for a body that falls remains in the state in which it fell, till some exterior cause dis-

places it. It is equally impossible that the air should be the cause of this gravity; since, being itself heavy, it must resist the velocity of falling bodies. We must, therefore, seek the cause of this gravity elsewhere. Perhaps the opinion which comes nearest the truth is, that the earth has the same power of attracting bodies, placed at a certain distance from it, as the loadstone has of attracting iron. But it is possible that the cause of gravity is some foreign matter, which is distributed through all bodies.

Although we cannot perfectly determine the cause of this property of bodies, yet nothing is more evident than the advantages which result from it. Without gravity, we could not possibly move ourselves as we now do. Our centre of gravity is about the middle of our body. When we lift up the right foot, we must bear this centre on the left. If we stoop forward, we are in danger of falling; but by advancing the right foot we prevent the fall, and make a step. Thus our walking is, in some sort, a series of continually prevented falls, during which the centre of gravity is preserved between our feet. Hence it is, that in going up a hill we bend the body forward, and in going down, bend it back. We also stoop forward when we carry a burden upon our shoulders, and lean back, when we carry one in our arms. All this is regulated according to the laws of gravity, which directs the motions of animals when they walk, swim, or fly.

The same laws regulate the motions of those prodigious bodies which roll in the firmament. The sun attracts the planets, and each planet in its turn attracts its satellites, or, what amounts to the same, the planets gravitate towards the sun, and the satellites towards the planets; for bodies which revolve in a circle would depart in a right line from it, if they met with no obstacle. The planets revolve in their orbits with astonishing velocity, and yet never deviate from their course; and the moon never flies off from the earth, though attached by no chain to our globe. It would seem, therefore, that so rapid a motion as that of the moon must project it far into unlimited space, were there not some power which continually impelled it toward our earth, and became a

counterpoise to its centrifugal force. That power is the gravitation of the moon towards the earth. Were our earth itself either lighter or heavier than it is, what would be the consequence? It would either get too near, or too far off from the sun. In the first case, no person would be able to endure the heat; in the second, the cold would be insupportable. Every thing on the face of the earth would be either burnt up or frozen. What then would become of the seasons? And what would become of a thousand things, so indispensably necessary to the being and comfort of men?

Here again, O Supreme Wisdom, we find a monument of thy wonders. By a cause so small in appearance, thou givest motion to animals, and to the celestial bodies. By the laws of gravity alone, thou preventest even the smallest grain of dust from being lost, either from our earth, or from any of the other globes. But it is in this that the greatness of thy power and wisdom consists, that often the greatest and most astonishing effects are produced by means which appear to us the most insignificant. In this respect, what an infinite difference is there between God and man! Vast preparations and complicated means are necessary for us, to bring about the least important ends! He who discovers not the greatness of God here must be very inattentive or very ungrateful. May we endeavour to avoid both. May we consider the gravity of bodies as one of the means of our terrestrial happiness, and magnify our Creator with our whole hearts, for this wise ordinance!

## JULY XXVIII.

### VARIOUS EFFECTS IN NATURE PROCEED FROM THE SAME CAUSE.

UNIVERSAL nature is an endless chain of causes and effects. And as all the parts of the universe are connected with each other, every motion and every event depends on a preceding cause, and this event becomes in its turn the cause of those effects which succeed it. The whole

constitution of the world is well calculated to convince us, that not chance, but divine art, and a wisdom beyond our conception, first erected this astonishing edifice, impressed motion on its different parts, and determined the great chain of events, depending on and succeeding each other. It is not difficult to acquire this degree of knowledge; for though that which we have of the constitution of nature be very limited, we nevertheless still see a number of important effects derived from causes evident enough to the human understanding. Many natural phenomena may furnish us with examples of this.

What a variety of effects does the heat of the sun produce! It does not only contribute to the life of an innumerable multitude of animals, but also to the vegetation of plants, to the ripening of seeds and fruits, to the fluidity of water, to the elevation of vapours, and the formation of clouds, without which neither rain nor dew could fall upon the earth.

The air also is so constituted as to accomplish a variety of purposes at once. By means of this element, animal bodies are preserved, the lungs cooled, and all the vital motions acquire energy. By air the fire burns, and by it the flame is fed. By its motion and undulations it quickly conveys all sorts of sounds to the ear. It gives a spring to winged animals, and enables them to fly from place to place. It opens man an easy path through the great deep, the vast expanse of which he could not pass over without it. It is by the air that the clouds are suspended in the atmosphere, till, becoming too weighty, they fall down in rain. By the air the morning and evening twilight is formed, which tends to lengthen out the day; and without it the gift of speech, and the sense of hearing, would be useless to us. All these advantages, and many more, depend on that air in which we live and breathe. This wonderful element, which encompasses our globe, which is too subtile to be perceived by the eye, and whose force, notwithstanding, is so great that no other element is able to resist it, is surely an evident proof of the wisdom of our Creator!

The force of gravitation alone, which subsists in all bodies, establishes the earth, preserves the mountains,

and gives fluidity to the waters. It confines the ocean in its depths, and the earth in the orbit which was prescribed to it. It maintains each being in its proper place in nature, and preserves between the heavenly bodies those distances which should separate them.

Who can describe the various uses of water? It serves in general to dilate, soften, and mix a great number of bodies which we could not otherwise use. It is the most wholesome of all drinks, the best nourishment of plants, and gives motion to our mills, and to a vast number of machines, procures us a multitude of fish, and brings us the treasure of other worlds.

How various and innumerable are the effects which fire produces! By it solid bodies are either melted and changed into fluids, or become solid bodies of another kind. It causes fluids to boil, or reduces them into vapour. By it heat is distributed through all bodies; and it contributes to procure animals not only life, but its principal comforts.

It is not only in the kingdom of nature that we see the most diversified effects proceeding from the same cause, for often in the moral world one single propensity of the soul produces effects not less diversified. Let us, for example, consider the natural inclination we have to love our fellow-creatures. From this proceed the care which parents take of their children, the social union, the bonds of friendship, patriotism, goodness in those who govern, and fidelity in those who obey. Thus, a single propensity keeps each individual in the circle prescribed for him, becomes the bond of civil society, the principle in the hands of God of all virtuous actions, noble enterprises, and innocent recreations. All this proves, that the materials which compose the world were not thrown together by chance, without relation to or connexion with each other; but on the contrary, that the world is a regular whole, which the divine power has arranged with infinite wisdom.

In every part, in every phenomenon of the visible world, some rays of ineffable wisdom blaze forth before our eyes. But how much escapes the most attentive examination, and the profoundest researches of the most enlightened genius! If we seek in an object traces of

the divine wisdom, sometimes it shows itself on one side of the object, while it seems to hide itself on the other. Let not this discourage us from meditating on the works of God ; and let us use the wonders which he does discover to us, to excite us to glorify his name. Then our hearts shall feel the truth and force of those words of David : "The works of the Lord are great, sought out of all those who have pleasure therein," *Ps.* cxi. 2.

## JULY XXIX.

### SOME DISEASES OF PLANTS.

VEGETABLES are subject to many diseases. Sometimes they are covered with a whitish matter, which sticks to them like dust ; this is called mildew. This does not proceed from insects, as is commonly believed, but from a stagnation in the juices, and a commencement of corruption, which attracts the insects, and entices them to lay their eggs upon it. The stagnation of the juices is the first stage of corruption ; and it is supposed that this alone is sufficient to attract insects, because they are seen swarming by thousands, as soon as through a natural or artificial cause the circulation of the juices is stopped in a tree. Hence it is, that the weakest and worst situated trees are most frequently exposed to this malady. If the insects were really the cause of it, it would be impossible to produce it by art ; whereas, if a tree be designedly wounded, or be deprived of the care it requires, this is sufficient to bring the mildew. On a tree thus artificially weakened, thousands of insects settle at once, while the neighbouring trees are free from them. Thus, this corruption should no more be attributed to insects than that of flesh. It seems merely to be occasioned by the stagnation of juices, an accident which many circumstances may occasion.

Often a matter which resembles dew, but gluey, sweet, and corrosive, scorches and mars the plants ; this is called the honey-dew. It was imagined that insects

extracted this gluey matter from vegetables, or that bees brought their honey thither. But many experiments have proved that this matter falls from the air in the form of dew. In some countries it lies in little drops on a number of vegetables of different kinds, and in the space of a night it covers almost all the leaves of a long range of trees, on which before none was perceived.

Possibly this dew may be formed from the exhalations of flowers, and the blossoms of trees, from which the bees know how to extract such good honey; and if it fall in some places more than others, it must be owing to the direction of the wind. Perhaps, also, this matter may be the effect of a disease in plants whose juices are vitiated, and which may attract insects as the mildew mentioned above. For the weakest ears, boughs, branches, bushes, and trees, are those which are most subject to this disease. It has also been observed, that the leaves on which this species of dew falls, spot, blacken, and spoil; and it is very probable that this substance is the cause of it.

Here also we find traces of the wisdom of the Creator; for seeing the insects have need of nourishment, it is for our benefit that they should be obliged to seek it on those vegetables, which on account of their diseased state would be unprofitable or injurious to it. This is a new proof of the particular provision which God made for man when he established the world. It is owing to this wise arrangement, that these animals take nothing of what is necessary for our support, but on the contrary, attach themselves to that which would be destructive to us. It is a truth that in the economy of nature each plant, tree, and animal serves for the support of different species of animals. We avenge ourselves on those which are troublesome to us, by seeking to destroy them; probably we should be rather led to preserve them, if we considered how useful they are, and how little real damage the greater part of them occasions.

## JULY XXX.

MEANS OF SUBSISTENCE WHICH NATURE PROVIDES FOR  
ANIMALS.

It is a great proof of the goodness of the divine omnipotence, that a sufficiency of food is provided to support all the living creatures with which this world is stocked. It is not indeed astonishing that the countries under the temperate zones should furnish subsistence for their inhabitants; but that it should be the same every where else, even in places where we could least expect to find food and pasture, and that the necessary aliments should ever be found in sufficient quantity to support so many species of animals, is what must be attributed to the tender care of a wise Providence. We may first observe that God has proportioned sustenance to the wants of the animals which are to consume it.

This supply is superabundant almost everywhere; but this profusion is not such as that the aliments corrupt and get spoiled, for this would be prejudicial to the world. What is most remarkable in this matter is, that among so many sorts of food, the most useful and necessary are in general the most common; and such as are most easily multiplied. As there are a great many creatures which feed on grass, the fields, which are numerous are well covered with grass and wholesome plants, which grow of themselves, and easily resist the intemperature of the air. Is it not a matter worthy of attention, that corn, which is the principal food of man, can be cultivated with so little trouble, and multiplies itself in so astonishing a manner? For instance, if a bushel of wheat be sown in a good soil, it will produce one hundred and fifty.

Is it not a very wise appointment of the Creator, that the taste of animals should be so different; that some love to feed on herbs, others on corn; some on flesh, others on worms, insects, &c.; some are easily satisfied, others are insatiable. If all sorts of animals must have had the same kind of food, the earth would



be speedily turned into a vast desert. The difference of tastes which we perceive among animals is a certain proof that it is not by chance that they are attached to this or that sort of food, but is owing to natural instinct, which causes them to prefer those aliments which are best suited to the natures of their bodies. By this means, all the productions of the earth and sea are well distributed. Not only every living creature is richly provided for, but even the things which, becoming corrupt, would be injurious, serve for a useful purpose; for the most wholesome birds would perish, and the dead carcases of fish, birds, and beasts would exhale a most deadly poison, without this wise appointment of the Creator, who has ordained that various animals should find in these things an agreeable nourishment.

Food offers itself spontaneously to the greater part of beasts, notwithstanding they require great art to discern it, and must be prudent and cautious in their choice. The aliments are so prepared that what is useful to one species is hurtful to another, and turns to poison. After many experiments, botanists have found that cows eat of 276 kinds of grass and herbs, and reject 218; that goats use 449, and leave 126 untouched; that sheep feed on 387, and that there are 141 which they will not eat; that the horse takes 262, and rejects 212; that swine are contented with 72, and that there are 171 which they will not feed on. Other animals are obliged to seek their food laboriously, and afar off; to dig for it in the earth, or to collect it from a thousand places where it is scattered, or even to draw it from another element. Several are obliged to choose the most favourable time of the night that they may satisfy their hunger in safety; others have to prepare their food, take the seeds out of their husks, to break those which are hard, swallow little stones in order to assist digestion, take off the heads of insects, upon which they feed, break the bones of the prey they have taken, and turn the fish which they have seized that they may swallow them by the head. Many would perish, did they not collect in their nests provisions for the future. Others could never catch their prey without having recourse to wiles and cunning, spreading their nets, laying their

snares, and digging holes. Some pursue their prey on the land, others in the water, and others in the air.

The more the nourishment of animals and their manner of procuring it are diversified, the more we should admire the wisdom and goodness of God in the preservation of his creatures. Let us reflect on the glorious perfections of our heavenly Father. How many occasions do we find to magnify his name!

## JULY XXXI.

### A HYMN OF PRAISE.

GLORY be to God Most High! Magnify the Lord, O ye heavens! Who would not delight to praise his name? Thou sun, exalt his power; thou moon, magnify thy author; ye stars, the brilliant flambeaux of the night, glorify our God! Ye clouds, which he suspends in the air, proclaim his greatness! He has spoken, and ye received existence! Let all beings rejoice in his goodness! Celebrate him, all ye inhabitants of the earth! Let the monsters from the depths of the abyss praise their Creator! Let the fire proclaim his power, and the mountains his strength! Let the ascending vapours be an incense to his praise! Let the tempest, which terrifies by its noise, while it is a blessing to the world, be a hymn in honour of his power! Ye peaceful flocks, which feed on the grass of the fields; and ye trees, laden with blessings, celebrate the beneficent God! Let the notes of the airy songsters, let the industry of the insect which crawls on the earth, and let all that exists, magnify his majesty! Great is the Lord Jehovah! Let us praise and exalt his name! The heavens and the earth are full of his glory!

### VARIETIES IN THE STATURE OF MAN.

THE whole height of the human body varies considerably; and whether more or less, is here of little consequence. The ordinary height is from five to six feet.

Some of those who inhabit the northern countries along the frozen seas are less than five feet high. The shortest men we know of, are those who inhabit the tops of the mountains in the island of Madagascar. These are scarcely four feet high. Many of these dwarfish people came originally from countries where the inhabitants are of the ordinary size ; and the principal cause of their degeneracy must be sought in the nature of the climate where they now live. The excessive cold which prevails there during the greatest part of the year causes both vegetables and animals to be less than in other places ; and may it not have the same influence on men ?

On the other hand, there are nations of a gigantic size. Of these, the most celebrated are the Patagonians, who dwell near the straits of Magellan. We are assured that they are from seven to twelve feet high. It should not appear impossible that there are people of a larger size than Europeans ; for, besides the traces which we have of this in antiquity, we have seen in our own climate men from six feet and a half to eight feet high and upwards, who were notwithstanding, in general, well made, healthy, and fit for all those exercises and labours which require activity and strength.

Adorable Creator ! thy wisdom is evident also in the varieties of the human form. All that thou hast made, in the animal, vegetable, and mineral kingdoms, has been by weight, number, and measure. Everything bears thy image : the dwarf, as well as the giant ; the blade of grass, as well as the oak ; the worm, as well as the elephant.

## AUGUST I.

### A MEDITATION ON THE WORKS OF NATURE.

O FATHER, Creator of the universe, and Preserver of every living creature ; how great is thy majesty ! How many are the wonders which thou presentest to the eyes of man ! It is thy hand which has spread out these heavens, and strewed them with stars !

To-day, I yet behold the sun coming forth in all his

splendour, to reanimate nature. To-morrow, it is possible, I shall not enjoy the pleasure of hearing those birds which now cause the woods, vallies, and fields to resound with their melodious notes. I feel that I am mortal, and my life withers like the grass of the fields; it fades as the flower cut off from the branch, where it grew. Who can tell how soon that word of the Almighty shall reach my ear, Man, return to thy dust!

When the grave shall have swallowed me up; when silence and darkness shall have encompassed me about; when worms shall have fed on my mortal body; what will then remain of all my earthly possessions! Shall not all be lost to me, though all had here succeeded according to my wishes, and I had enjoyed unmixed happiness?

O how foolish should I be, were I to attach myself to the perishing goods of this life; were I to aspire after great riches, or be ambitious of empty honours; or if, permitting myself to be dazzled by vain splendour, envy and pride should find access to my heart!

If, too eager in my desires, I have pursued what I ought not to have aspired to, I humble myself before thee, O God! Behold me, O my Maker; and let that which thy wisdom has appointed, be done unto me!

Foolish man, who is led astray by pride, prescribes laws to his Creator! He dares to blame the purposes of eternal wisdom! And thou, Almighty Friend of Man! thou lovest him more than he loves himself, when thy goodness denies him those deceitful enjoyments which are the objects of his wishes.

When in the morning, on the green turf covered with dew, everything presents itself in a pleasing form; when the wings of the night have cooled the sultry air of summer; Wisdom thus accosts me: O mortal, why dost thou torment thyself with anxious cares about the future? Why dost thou abandon thyself to wretchedness? Is not God thy Father? Art not thou his child? Shall not he who formed thee take care of his own work? The plan of thy existence is not limited by earth; it takes in eternity! Thy life is but a moment, and the longest earthly felicity is no more than a pleasing dream. O man, God has made thee immortal!

The contemplation of immortality elevates us above the earth, the universe, and time itself. Manifest thyself in my heart when, seduced by false views, I am ready to depart from the paths of virtue!

The roses which crown the head of the vicious shall soon fade; his shameful enjoyments dishonour him, and repentance succeeds them. I am only a sojourner upon earth, and immortal joys alone are worth my pursuit.

O thou, who delightest in dispensing blessings, give me a heart which loves nothing but goodness; a heart, where virtue and holiness reign! Let others covet worldly prosperity; I ask of thee, my God, grace to be contented with my situation, to make me faithful in the discharge of my duty, and deserving the name of a wise man and a Christian!

#### AN EXHORTATION TO PRAISE GOD.

MY soul, bless the Lord; and let all that is within me praise his holy name! Bless the Lord, O my soul, and forget not his benefits! Is he not thy Father and thy Sovereign? Is it not he who has given thee thy being; who has created thee immortal, intelligent, and capable of knowing and praising him? Is it not the Lord who has formed thy frame, that wonderful assemblage of flesh and veins; who maintains thy breath, and keeps all thy bones that not one of them is broken? To whom art thou indebted for life, health, and happiness? Is it not to thy God? Look behind on the path in which he has led thee from the first moment of thy existence; is it not covered with monuments of his goodness?

Being favoured by thy Creator, lift thy eyes, and contemplate the innumerable benefits which surround thee; but at the same time fix thy thoughts on futurity, and see what faith discovers beyond the grave. Endeavour to conceive the ecstasy thou shalt experience, when, freed from evil and imperfection, immersed in holy and heavenly joy, and clothed with a glorious body, thou shalt approach God, thy Creator and Preserver; and Jesus, who has purchased thee this celestial happiness,

who shall place thee upon his throne, that thou mayest eternally enjoy his glory!

Prostrate thyself, child of God, and inheritor of eternal happiness ; prostrate thyself, and let emotions of the most lively gratitude fill thy whole heart ; and begin here below the occupation of eternity ! Praise the Lord, O my soul !

## AUGUST II.

### VEGETATION OF THE STALK OF WHEAT.

THE wheat plant is composed of the principal stem, the stalks growing out of the sides, and the branches which spring out of those. The stalk begins to form as soon as four green leaves make their appearance. If the little plant be then taken, and the under leaf be cautiously pressed or separated, a little white point will appear, which by degrees grows into a stalk, and the root appears under the first leaf. The white point grows out of the substance of a knob, unfolds itself into green leaves, and produces a new point at the side. But these different points, and the stalks which grow out of them, are not all designed to bear fruit ; several of them wither and fall off. When the principal stem has got a little growth, a considerable revolution takes place in the plant ; all the sap is then employed in the formation of the ear.

But before this, when the plant begins to vegetate, four, sometimes six, leaves are observed to spring from so many knobs : these prepare the nutritive juice for the ear, which may be seen, in miniature, when in spring we divide a stalk in the middle. Even in autumn this ear may be seen like a little cluster, to which the knobs are still very closely united. When the plant begins to put forth his seed, the two upper leaves of the stalk join together, inclose the ear, and protect it, till it has acquired some degree of consistence. Before this, all the knobs, and particularly the two last, still very soft, are very close together, and the intervals which separate these knobs are of course very small ; but as soon as the ear

has pierced through its coats, all these parts lengthen, and the leaves give them up all the juices they contain. The knobs harden by degrees, the lower leaves dry up, and the sap which nourished them is now employed only in strengthening the stalk.

After all these preparations the blossom appears, which furnished the grain with its best nourishment. This blossom is a small white tube extremely slender, which comes from the seed leaf. Many other little tubes encompass this bag: they are first yellowish, afterwards they grow brown, and finally become blackish, before they fade and fall off. The principal use of these tubes is to nourish a little tuft which may be seen in the seed-bag. As soon as the corn has done blossoming, the grains which contain the germ are seen, and which come to their perfection a long time before the mealy substance appears. This substance gradually multiplies, whilst the sap collects round a part extremely fine and delicate, resembling down. This down, which continues after the blossom, serves, among other uses, to support the opening of the great canal or tube which goes through the corn. The fruit ripens as soon as it has attained its full growth: then the tube and the ears begin to grow white; and the green colour of the seeds changes into a yellow, or dark brown. These seeds are, notwithstanding, very soft as yet, and their mealy part contains a great deal of moisture; but, when it arrives at its full maturity, it becomes dry and hard.

We cannot sufficiently admire that wisdom of God which appears in the formation and growth of a stalk of wheat. Those who are accustomed to reflection may see it in the smallest tube. For instance, the leaves which surround it, before it has acquired its natural size, have their use; and it appears that the wisdom of the Creator has placed them round the stalk for the same purpose that an architect erects a scaffolding about the building which he intends to rear, and which he pulls down when the building is completed. For, as soon as the tube has acquired the length and consistence which it ought to have, the leaves which protected it dry and perish. Whole months pass away before the ear ventures to expose itself to the action of the air; but as soon as

all is prepared for the formation of the fruits and flowers, they appear in a few days. With what skill are the tubes and ears constructed! If the first were higher, the nutritious juice could not so well penetrate them. If, on the contrary, the grain had been placed lower, birds and other animals could easily reach to and destroy it. If the stem were weaker and thinner, the wind would break it; and if it were stronger and thicker, small animals might lodge in it, and the birds perch on it and pick out the grain.

Merciful and beneficent Father! may all those who at present walk around the fields of wheat, and behold with joy that forest of waving ears, feel at the sight all those sentiments of admiration and love which thy wisdom and goodness should naturally excite! May each of those, for whose sake thou causest these abundant harvests to ripen, render the thanks which are so justly thy due!

### AUGUST III.

#### THE DOG-DAYS.

THE sun appears to have not only a diurnal motion, which conveys it from east to west, and causes day and night; but also another motion from west to east, by means of which it returns at the end of 365 days to the same star in the heavens, from which it appeared to have been removing for six months, and to which it seemed to approach for the other six.

Hence ancient astronomers divided the seasons by the stars which the sun seemed to pass in his annual course. This course they divided into twelve constellations; these are the twelve signs of the zodiac, which they termed the twelve houses of the sun, because he seemed to dwell a month in each of these signs.

The summer season begins when the sun enters Cancer, which happens the 21st or 22nd of June. The sun is then at its greatest height above our horizon, and sends his rays almost perpendicularly upon us; and it is at this time that the heats of summer begin, which increase more and more in the following month, in proportion as



the earth is heated by the scorching rays of the sun. Hence it is that the month of July, and a part of August, are generally the hottest part of the year; and experience has proved that the heat is at its greatest height from the 20th of July to the 20th of August. Now of all the stars with which the sun comes into conjunction, the dog-star is the most brilliant. Lost in the rays of the sun, it disappears from our eyes for a month, as is successively the case with all the stars which the sun meets with in his course; and the month of its disappearing is the time called the dog-days.

These observations would be of little importance, if they did not serve to combat a prejudice deeply rooted in the minds of many. An old tradition attributes the heat which is commonly felt in these times, to the influence of the dog-star on the earth, on men, and on animals. This opinion is absurd from this circumstance only, that the occultation of the dog-star in the rays of the sun does not always take place in that time which we call the dog-days. These days, properly speaking, do not begin till the end of August, and do not end till the 20th of September. And as the dog-star, or Sirius, always advances further, it will in time reach to October and November, and in the end to January; so that the most intense cold of the year will prevail in the dog-days.

When we reflect on this, we see it is impossible that this star should occasion those heats which are felt on the earth, and the consequences resulting from them. When, therefore, in the supposed dog-days, wine or beer spoils in bad cellars; when matters apt to ferment turn sour; when ponds dry up, and fountains cease to flow; when dogs and other animals, and even men themselves, are attacked with madness; when we are seized with maladies which an imprudent conduct during the heat brings upon us; this does not happen because a star is hidden behind the sun; it is the extreme heat of the air in that season, and our own imprudence, which are the alone causes of all these effects.

It is therefore high time to renounce a prejudice which does little honour to the human understanding. He that can persuade himself that certain figures which his

imagination has placed in the sky, can have any influence on the earth, or on the health and reason of man, discovers a great want of judgment. It is not the stars, but ourselves, that we should accuse of the evils which we suffer. If, therefore, mortal maladies should prevail at this season, let us beware of attributing this to the influence of the dog-star, which is purely chimerical; let us rather believe that they originate in our inadvertency and misconduct. To consider the subject seriously, we sin against a wise Providence by indulging such prejudices. Can we suppose that the supremely good God, who governs the world, has created any thing in heaven or earth for the torment and misery of his creatures? Would not this be to believe in an inevitable fatality, which we cannot admit while we acknowledge a Creator whose essence is wisdom and goodness. Instead of being guilty of such an error, let us glorify God, and secure our own tranquillity, by believing that we are under the protection of a most indulgent Parent, without whose permission not even one of our hairs can perish.

## ON DIFFERENT KINDS OF AIR OR GASES.

THE air we breathe is essentially necessary for the support of our lives; no animal can long continue in life in the absence of air. It was the universal opinion of mankind, till of late years, that the air of the atmosphere is of the same kind, and that all sorts of air is of that same nature; the only difference arising from the adventitious mixture of exhalations and effluvia from other substances. But the discoveries made in the present and in the closing part of the last century, have entirely removed this ignorance, and dissipated this dark cloud from the face of science.

We observe bodies under various forms:—1st. The solid, or matter cohering in firm masses: these are different in weight, figure, hardness, colour, texture, and in many other properties. 2nd. The liquid form of matter varies also; there are many sorts possessing properties exceedingly diversified. 3rd. The form of elastic fluids, or

the gases of which embrace many sorts, are distinguished likewise by their peculiar properties.

The property which characterizes this last class of bodies is, that it is capable of great compression, and that it restores itself to the same dimensions on the removal of the compressing force, as we see when common air is compressed in a syringe, condenser, bellows, or otherwise.

The main body of the atmosphere consists of air. There are, indeed, several substances in it, as vapour of water, and various exhalations and effluvia; but these are inconsiderable in comparison of the part properly denominated air. In 1774, this air was found to consist of two sorts, quite different from each other. The discovery was made by Dr. Priestley in England; and about the same time by Scheele in Sweden. Twenty-two parts of one hundred, by measure, of atmospheric air, is of a nature fitted in a high degree to support the combustion of bodies, and no bodies will burn in the air when deprived of this part. It is called oxygen, because it converts many bodies into acids by its union with them; it is this portion, also, which supports animal life, and the combustion of burning bodies. The other part, being about seventy-eight measures in every hundred, has been called azote, because it is of itself destructive of animal life. It is, however, more commonly called nitrogen, because, in union with oxygen, it forms nitric acid. Did the air consist of oxygen alone, it would prove too powerful for our frame, and would speedily waste the vital spark which it now feeds; as it would also soon exhaust all combustible matter. But diluted as it is with so large a portion of nitrogen, it becomes congenial to our constitutions, and is fit for ten thousand purposes in the economy of nature.

Farther investigation soon proved that there is an extensive class of bodies which have the mechanical properties of air. They are called gases; different sorts having properties in many respects widely different. Some few are simple or elementary, and many are compounds. They are fluids, compressible, elastic, and transparent. The atoms which compose them are very

probably kept at a distance from each other by a repellent force, which becomes greater as they are pressed nearer together.

Steam and various vapours are of the same nature with the gases, excepting that their elastic state is not permanent. They return to a liquid or solid form on the abstraction of caloric, which substance seems to be the universal cause of this form of bodies.

Besides the two above mentioned, there are two other simple permanent gases, viz. hydrogen and chlorine.

Hydrogen is so named, because, in union with oxygen, it constitutes water. It is the lightest of all gases, being  $14\frac{2}{3}$  times lighter than common air, and 16 times lighter than oxygen gas; 100 cubic inches weighing only  $2\frac{1}{10}$  grains. On this account it has been employed to inflate balloons. Burning bodies plunged in it are extinguished, and animals cannot live in this gas. It has the curious property of burning, when lighted in contact with oxygen gas, emitting a flame of a yellowish white colour; and it may be mixed, at common temperatures, with oxygen gas, and nothing very remarkable takes place. But if a lighted taper be applied to the mixture, or an electric spark be made to pass through it, a violent explosion ensues, and the two gases unite, forming a new body, which is found to be pure water. Two measures of hydrogen always unite with one of oxygen; if this proportion be exceeded in the mixture on either side, the excess remains in the vessel in its usual state. Hydrogen enters into combination with many other bodies, and particularly it forms a considerable portion of vegetables. Combined with chlorine gas, it forms muriatic acid. This last mentioned gas is 36 times heavier than hydrogen, and possesses many remarkable properties.

The compound gases are numerous. About forty of them have been examined with accuracy. That which is obtained from pit-coal, of late so usefully applied to the lighting up of our streets and manufactories, is carbureted hydrogen gas. It rises abundantly from stagnant water, when the mud is stirred at the bottom; and exhales too, in large quantities, from some coal mines, often proving destructive to the miners by its taking fire on the approach of their lights. It was called the fire-

damp. The explosive effects of it are obviated by Sir H. Davy's safety lamp. It is composed of hydrogen and carbon (charcoal), and was one of the first elastic fluids distinguished from common air with certainty. When charcoal is burned in a vessel of oxygen gas, and the products are preserved, it is found that a gas very different from the oxygen occupies its place in this new gas : any burning body is immediately extinguished by it, and an animal put into it immediately dies. Experiments show that it is equal in weight to the oxygen employed and the charcoal burnt, and is a combination of these two substances. It exists in abundance in chalk, limestone, marble, and many other substances ; and is likewise formed during the vinous fermentation of liquors, and in the burning of charcoal. It is much heavier than common air, and is often found at the bottom of wells, brewers' vats, and in cellars. People should not sleep in close rooms where charcoal is burnt, or near lime-kilns ; and workmen should not descend into wells, cellars, or brewers' vats, without caution. When danger is suspected, a lighted candle should first be let down ; if it go out, quick lime should be let down and sprinkled with water, and this will absorb the gas. When found in mines and caverns, it is called the choke-damp. Its destructive effect arises from its causing suffocation. It has acid properties, and has been designated by several names by those who have examined it, as gas sylvestre, fixed air, ærial acid, mephitic acid, calcareous acid ; but since the true discovery of its composition, it has been called carbonic acid gas. It is of extensive use in the operations of nature ; plants decompose it, the carbon entering into their substance ; it resists putrefaction. By artificial pressure, this gas is condensed in water, which absorbs it, when it becomes brisk and pleasant to drink, having many medicinal virtues. The other gases have their various uses, and contribute to accomplish the gracious and wise designs of our beneficent God. All his works praise him ; and shall man, who is capable of contemplating these works, forget to acknowledge in holy reverence the Lord of earth and skies ? The different kinds of air are doubtless necessary to the perfection of his works. They all contribute to our benefit, and are

in such proportions to each other, as contribute most of all to the general good and happiness of mankind.

## AUGUST IV

### SLEEP.

PEOPLE fall asleep with more or less rapidity, according to their constitution and state of health. But whether sleep come suddenly or slowly, it always comes in the same way ; and the preceding circumstances are the same in all men.

The first thing that happens when we begin to sleep, is the stupefaction of the senses, which, no longer receiving impressions from external objects, relax and fall by degrees into a state of inactivity. Hence it follows, that the attention diminishes, and is at last lost ; the memory becomes disturbed, the passions become calm, and the connexion of thought and reasoning becomes deranged. As long as we perceive sleep, it is but the first step to it ; we are not sleeping, but dozing. To be properly asleep, we must have no longer that consciousness, that reflected idea of ourselves, which depends on the exercise of our memory. To the stupefaction of our senses is soon added a stiffness and insurmountable resistance of the muscles. This is the second stage of sleep. This stage produces several symptoms in the machine, which may be observed in those who sleep in a chair. The eyelids wink, and open and shut of themselves, and at last sink down ; the head totters, and falls forward ; we endeavour to erect it, but it falls lower still ; and at last we have no more strength to raise it up ; the chin rests on the breast, and in this attitude sleep is quietly continued. While the head continues to totter from side to side, all the muscles are not as yet completely relaxed ; but a little after, the relaxation becomes total, and the will has no power to prevent it. When sleep is profound, all the voluntary and animal functions are suspended ; but the natural or vital functions are then performed with more effect. This is the third change which sleep produces in us.

The preparation of humours by the chyle is better performed when we sleep. When we are awake, the natural motions are sometimes disturbed by those which are voluntary; and the motion of the fluids is accelerated in some vessels, and retarded in others. The blood is wasted, so to speak, in external action, and consequently it does not supply the internal parts in such abundance. The circulation of the blood is very strong in those parts of our bodies which are in motion; and is continually pressing the humours in the secreting vessels, whilst, on the contrary, it is so weak in others, that the chyle can scarcely be changed into blood. A sweet sleep re-establishes the equilibrium everywhere; the vessels are equally opened; the juices run uniformly; the heat is preserved in a proper degree: in a word, nothing is dissipated; all goes to the profit of the machine. Hence it is, that after a good sleep, we feel rested, refreshed, strong, and vigorous.

All these circumstances are well calculated to cause us to acknowledge the goodness of God towards us. What preparatives, what tender care to procure us the blessing of sleep! What merits our attention and gratitude most is, that sleep is accompanied with a universal stupefaction of the senses, which comes upon us unawares, and which we cannot resist. The first of these circumstances renders sleep more sound and refreshing. The second makes it an inevitable necessity. What admirable wisdom of Providence appears in the relaxation of the muscles during sleep! The first which grows stiff is destined to defend one of the most precious of our organs, and one that is most exposed to danger, viz. the eye. As soon as we grow drowsy, the eyelid falls down of itself, covers and protects the eye till we awake. In other parts of our body, the muscles contract with more force; because their being relaxed might be inconvenient, and even dangerous.

Let, therefore, the hour in which we are disposed to enjoy the sweets of sleep be preceded with thanksgiving to our heavenly Father. Let us bless him, not only because the days happily succeed each other, but because he has constituted us in such a manner that sleep refreshes and recruits our strength. Let us lie down with

these meditations ; and let them be the first which shall present themselves to us when we awake.

## AUGUST V.

## THE DIVISIBILITY OF MATTER.

WE may easily be convinced of the infinite divisibility of bodies, by the different perfumes which plants and flowers exhale. How amazingly small must the odoriferous corpuscles of a carnation be, which diffuse themselves over a whole garden, and meet the sense of smelling everywhere ! If this be not a satisfactory proof of this extreme divisibility, let us consider other objects which nature presents us ; and, for instance, let us examine one of those silk threads, the work of a despicable worm. This thread, which is 360 feet in length, weighs only a grain. Consider, again, into how many parts a length of 360 feet may be divided, without any of the parts becoming imperceptible. An inch can be divided into 600 equal parts, each of which will be as thick as a child's hair, and consequently may be easily seen by the naked eye. Therefore a grain weight of this silk may be divided into at least 2,592,000 equal parts, each of which may be seen without the assistance of a microscope. And as these same parts may be farther divided into many other millions of parts, a division which may be continued beyond the reach of thought, it is manifest that this progression may be continued *ad infinitum*. The last particles which cannot be separated by human industry must still have extension, and consequently be capable of division ; although this cannot be realized in this world.

If we examine the animal kingdom, we shall have new proofs of the infinite divisibility of matter. A great naturalist put pepper into a glass of water, and by means of a microscope discovered animalculæ a thousand millions of times less than a grain of sand ! How inconceivably small, then, must the feet, the organs of sense, the muscles, veins, and nerves of such an animal be ! What must their eggs and their young be ! And how



small must the members and vessels be, together with the juices which circulate in the veins of those young! Here imagination itself is lost, and all our ideas confounded; and yet nothing is more certain than what we have already mentioned.

What deserves our attention especially is, that the more the works of nature are magnified by our glasses, the more regular and beautiful they appear. But it is the reverse with the works of art; for when these are examined with a microscope, we are astonished to find them rough, coarse, and imperfect, though they have been executed with the greatest care, by the most eminent artists.

Thus God has impressed an image of his own infinity on the smallest atom. The smallest body is a world in which millions of parts are found united and arranged in the most perfect order. How astonishing is that wisdom which can operate in the little as well as the great, with so much regularity and perfection! How great must that power be which could bring out of nothing that infinite number of bodies of all kinds! How rich must that divine goodness be which manifests itself in those minute bodies, seeing there is none of them which has not its perfection and use!

Considerations like these are very proper, to make us feel the limits of our own understanding. The least worm, the smallest insect, the least grain of dust may convince us that there are many thousands of things of which we are ignorant, and which we cannot explain. Try, O man, to enumerate the parts of which the body of an animal is composed, which is a thousand million of times less than a grain of sand! Endeavour to ascertain how minute one of those rays of light must be, several millions of which may pass through an opening not larger than the eye of a needle! How speedily must thy ideas be confounded, and thou be obliged to acknowledge thy ignorance, and the limited state of thy understanding! How then canst thou be proud of thy knowledge, and have the presumption to find fault with the ways of the Lord, and speak against the arrangements he has made in nature? Canst thou imagine that thou canst even know the millionth part of the beings

which exist ? It is therefore our duty, yea more, our glory, to acknowledge our own ignorance, and the infinite grandeur of God.

Such is the use we should make of these meditations. Let us reflect on the infinite divisibility of bodies, only to feel more forcibly how great God is, and how little we are. This will give us room to admire the wisdom of the Creator ; for by means of the infinite smallness of the particles of matter, every void may be filled up without the least interruption of motion ; and the universe presents us with a spectacle continually varied.

## AUGUST VI.

### THE EXTERNAL STRUCTURE OF INSECTS.

In general, we judge those animals only worth our notice which are distinguished from others by their bulk. The horse, the elephant, the bull, and such like creatures, appear in some sort to merit our attention ; while we disdain to cast a look on the innumerable hosts of small animals which people the air, the vegetables, and the dust. How many insects do we trample on ! how many caterpillars do we destroy ! how many flies buzz about us without inspiring us with the least curiosity ! And we only think of means to destroy them when they are a little troublesome to us. Nothing can be more unreasonable than such inattention ; for it is certain that the power and wisdom of our Creator are not less manifested in the structure of a snail than in that of an elephant, a horse, or a lion.

The bodies of the greater part of insects are composed of many rings, which close on each other, and are employed in all the motions of the animal. The essential characteristic which distinguishes insects from all other animals is, that, properly speaking, they have no bones. Much wisdom is evident in this part of their formation. The motions which are adapted to all insects, the manner in which they are obliged to seek their nourishment, and especially the metamorphosis which they undergo, could not be performed with so much ease, if, instead of

those moveable rings, which recede from and approach to each other at the will of the animal, their bodies were connected and strengthened by bones.

It is observable in several insects that they have the power of contracting or enlarging their heads at pleasure ; that they can lengthen or shorten them, hide or cause them to appear, as their necessities may require. There are others, whose head always retains the same form. The mouths of insects are generally provided with a sort of teeth, or with a trunk. This disposition of the head is necessary, not only because of the aliments on which they feed, but also because of the persecutions to which they are exposed.

Many kinds of insects are without sight ; but they are compensated for this by feeling, or some other sense. Insects have two sorts of eyes ; those which are smooth and bright are generally few in number ; but the eyes which resemble net-work or shagreen, the cornea of which is cut in angles, are extremely numerous. There are sometimes thousands of them. None of these are moveable ; but their number and position supply this defect. The antennæ, or horns, with which the greater part of insects are provided, are of great service to them in their manner of life. These horns being extended before the body in its march, and feeling out the way, not only inform the animal of the dangers which threaten it, but also enable it to discern the aliments which are best suited to its nature.

The legs of insects are either scaly, or membranous. The former move by means of several joints ; and the others, which are more soft, move in all directions. Often the same animal has both kinds of legs. There are insects which have several hundreds of feet ; but these do not travel so fast as those which have only four. In respect to this part of the body, there is an infinite variety among insects. With what art must the legs of those insects be constructed, which fasten on smooth and polished surfaces ! How elastic must the legs of those be which leap ! How strong those which dig in the ground !

Two or four wings are placed in the middle of their bodies. Some of these are as transparent as the finest

gauze ; others are full of mealy scales. Some are without covering ; others are hidden in cases or sheaths. At the sides or at the extremity of the body, there are little orifices in the form of eyelets, which are termed *stigmata* or prints ; these are the organs of respiration.

The variety observable in the form and constitution of the limbs of insects is prodigious ; and the lives of many men would not suffice to describe the different figures of these little animals. How varied are the forms of those little insects which walk, fly, leap, and creep ! Nevertheless, however diversified their forms may be, we may observe in them the same perfect harmony and proportion. Would it not be the height of extravagance or perverseness not to acknowledge, in all this, the infinite wisdom of the Creator ? A man is no further either virtuous or rational, than as he acknowledges and adores God in all things. Let us acquit ourselves henceforth in those duties ; as often as we see an insect, let us study as much as possible its wonderful construction, that we may have a more lively sense of the greatness of the Most High.

## AUGUST VII.

### COMPARISON BETWEEN THE SENSES OF MAN AND THOSE OF ANIMALS.

HAVE some animals more perfect senses than man ? We can only answer in the affirmative in some particular cases ; for, in this respect also, we must say of man, that he is more highly favoured than all other animals. It is indeed asserted that spiders have a finer feeling ; that the vulture, the bee, and the dog have a keener smell. We know that by means of this the hound follows the track of the game, and that other dogs are taught to find truffle under ground. The swine also, guided by his smell, digs with his muzzle for his food. Stags are supposed to have so quick a hearing that they can discern the sound of bells at the distance of several miles ; and that the mole hears better under the earth than man, who inhabits the surface, and lives in the open air.

In regard to sight, the eagle among birds, and the lynx among quadrupeds, are said far to exceed man. These observations are certainly true ; but if we consider animals in general, and compare them with man, we are struck with the great prerogative given to him above all the brute creation. Man is naturally endowed with five senses ; and this advantage is not common to one half of the animals. The zoophytes, which form the connecting link between the animal and vegetable kingdoms, have only the sense of feeling. Many animals have only two senses ; some three ; and those which have five are considered the most perfect class. But even the most perfect animals have not senses more perfect than ours. There are certain senses among men which are astonishingly exquisite ; some Indians can judge by their smell how much alloy is mixed with the precious metals, as well as we can by the touchstone. I know a young gentleman who can distinguish every metal by the smell, and precious stones by the taste. The inhabitants of the Antilles can discern by their smell whether a Frenchman or a black has last passed along the road.

The perfection of the senses in some savages supplies the lack of intellect. Many people have exercised and improved certain senses to an astonishing degree. If man, like the animals, had no helps but his senses to procure food, and to preserve himself from danger ; if reason were not a more sure and suitable guide to him, his senses, without doubt, would have acquired the highest degree of refinement by exercise. But, in reality, man does not require senses more exquisite than those which he possesses. Reason compensates him more than a hundred fold for the privileges which certain animals appear to have over him. Besides, we may confidently assert, that if our senses were more exquisite, many inconveniences would result from it. Let us take, for instance, the sense of hearing ; were this in us as quick as the safety of some animals requires it should be in them, the most distant noise, and the confused din of a mixture of sounds, would continually interrupt our meditations and repose, and disturb our noblest occupations.

Thanks to the infinite wisdom of the Creator, who has so measured the degrees of our sensation that they are

sufficient to enable us fully to enjoy the blessings of nature, without disturbing the noble occupations of human reason. The limited state of our senses is a gain rather than a loss to us ; a perfection, rather than an imperfection. Happy he, who allows his reason to govern his senses ; and who enjoys all the advantages which must result from a perfect harmony between them !

## AUGUST VIII.

## THUNDER.

THE thunder roars ! O mortal, who is it that causes this terrible noise ? Who is it that darts the lightning from the clouds ? Behold, O sinner, it is the Lord of the universe ; it is the arm of the Most High, which hurls the thunderbolt.

Nature reposes in his hand ; he preserves and blesses it : but he shall speak, and at his word the heavens and the earth shall be consumed by the flames ; the heavens and the earth shall be no more !

The thunder roars ; how dreadful is the stormy sky ! The lightning flashes ! the thunderbolt is shot ! O God, how great art thou, and how terrible thy power !

The Lord, from the height of his throne, frowns upon us ; and by the glare of the lightning we see the grave open under our feet.

When the Lord sits upon the clouds, men and heroes tremble ; when he sharpens the sword of his anger, the universe turns pale.

God thunders, the sinner hears and shudders ; scarcely dare he lift his eyes towards him whose voice seems to threaten him with destruction.

O Christian ! the majesty of thy God can bring no terror into thy soul ; even when he sits on the stormy clouds, and darts forth his lightnings.

When the loud sound of the thunder astonishes the wicked, and fills him with terror, thy God watches over thee, and shields thee from the lightning.

And though he should even take away thy life, all his judgments are right ; he is thy Master, and thou shouldst

say unto him : Lord, my soul quietly submits ; whether I live or die, all my hope is in thee.

The Sovereign of the thunder is the Friend of the Christian. What though he should take me away suddenly from the land of the living ? I know that his thoughts towards me are thoughts of grace ; and he will cause me to draw salvation from the fountains of eternal happiness.

He who, when the sky is serene, glorifies his God, may be calm and peaceable when the sinner flies at the sight of the dark clouds.

But where can the sinner fly ? Can he escape from the sight of the supreme God ? In vain does he attempt to hide himself ; the lightning pursues and smites him in his dark retreat !

Fly not, therefore, O sinner ! Renounce thy illusion ; thou canst not hide thyself from the face of thy Creator, who follows thee everywhere, and whose hand is every moment upon thee.

When the thunder roars, thou tremblest and smitest thy breast ; but when the tempest ceases, thou returnest anew to thy sinful pleasures.

Sinner, if thou wouldst obtain mercy, thank the Lord for his long-suffering towards thee, and forget not the promises thou didst make in the time of thy distress ; think of this, and know that God will not be mocked.

God is merciful ; he spares the rebellious ; but he will not spare for ever. Jehovah is just ; and the Judge Supreme shall cite the criminal to his bar. What is the thunder that roars over our heads, in comparison of that solemn day in which we shall hear the whizzing sound of the tempest ? The elements themselves shall be dissolved by the same fire ; and the earth, and all it contains, be burnt up !

#### THE HAMSTER.

The hamster belongs to the mus genus, but bears the nearest resemblance to that of the *myoxus* or marmot. It agrees, however, with both in the construction of its habitation, its way of life, and its general properties.

In Gmelin's New System of Nature, the hamsters make the third general division, called *Criceti*; and the animal which is the subject of this paper is styled the *mus cricetus Germanicus*, or German hamster. The males are about ten inches long, and the tail about three; but the females are scarcely more than one half of this size. The former weigh from twelve to sixteen ounces each. Usually the head and back are of a reddish brown colour, the cheeks red, the sides paler, with three white spots; the breast, upper part of the fore-legs, and belly are black. But the colour varies much; sometimes they are found entirely white, or yellow; and there is a species which is almost entirely black. But what are most worthy of our observation in this animal are its feet, its teeth, and its cheek-pouches.

The hamster uses his feet to run, dig, and climb with. They are short and strong, having four toes, and a claw instead of a fifth toe, on the fore feet; and five toes on each hind foot. Its teeth are sixteen in number; it has two incisors in each jaw, and three grinders on each side. The grinders serve only to chew with; but the fore-teeth or incisors serve, not only to shell the corn, but also for weapons for its defence, and to dig up the earth where it is too hard for its claws alone.

The cheek-pouches are two skinny bags proceeding from the jaw, above the neck and shoulders, and afterwards sloping a little towards the spine. They lie inclosed between the muscles and the outward skin. On the outside these pouches are membranous, smooth, and shining; and in the inside there are a great many glands which secrete a fluid which serves to keep the parts flexible, and to resist any accidents which might be occasioned by the roughness of particular seeds. The hamster uses these pouches to collect and carry home the corn; and they are so large as to contain an ounce and a half of corn at once, which, on his return to his den, the animal empties, by stroking and squeezing them with his fore-feet, beginning behind, and pressing forwards towards the mouth. When a hamster is met with his cheek-pouches full of corn, he may be easily taken with the hand, without the risk of being bitten; for while his pouches are full he has not the free use of his



jaws ; but if he be allowed a little time, he soon empties his pouches, as related above, and, raising himself on his hind legs, stands boldly on his defence, or darts on his enemy.

This animal lives always in the corn-fields. Here it forms itself a subterraneous burrow, divided into several apartments, with two holes leading from the surface ; one is perpendicular, at which it goes in and comes out ; and the other, where it lodges its excrements, is oblique, that the wet may the more readily run off. One part of this subterraneous dwelling, divided into several apartments, is the storehouse, where it lays up its winter provisions of corn, beans, peas, vetches, linseed, &c., but each species of grain is kept by itself, in a separate cell. The chambers, where themselves and young lodge, are lined with straw or grass. The old ones dig their chambers several feet deep ; but those of the young scarcely ever exceed one foot in depth. In these holes the animal dwells alone, for it has a rooted enmity against all other creatures, and even against those of its own species, the females not excepted. When two hamsters encounter, one of them certainly falls ; and the weaker is devoured by the conqueror.

The hamster lies by day in his den, still and quiet ; and in the dusk of the evening he comes out, and runs about till midnight ; he then retires again into his hole, and continues quiet till about an hour before day-break ; then he comes out once more, and runs about till sun-rising.

The hamster's manner of living is considerably diversified ; like various other animals, he becomes torpid in winter, and continues in that state the greater part of the cold season. The male awakes about the middle of February, and the female in March. They do not leave their holes immediately on their recovery from this torpid state, but continue quiet till they have consumed the remains of their provisions, which amounts often to one third of the whole ; then, the former opening his hole in March, the latter in April, they come out, return to their former manner of life, and go about seeking herbs.

It cannot be denied, that the hamster is a very destructive creature. Some years they are so numerous as

to occasion a dearth by their immense consumption of corn. In one year, 11,000 skins ; in a second, 54,000 ; and in a third, 80,000, were brought to the town-house of Gotha, to receive a reward for their destruction. The hamster lives a considerable time, and multiplies prodigiously. The female brings forth twice or thrice in the year, and her litter is never fewer than six ; but oftener from sixteen to eighteen. The growth of the young is very rapid ; at fifteen days old they begin to dig the earth ; and in about three weeks they are capable of subsisting independently of the dam.

The hamster is preyed on by several animals ; but the ferret seems ordained to be its most inveterate enemy. It is not so strong as the hamster, but it is much more active and cunning, and by these means it prevails over him. In summer and autumn he is the ferret's food. He pursues him even into his den, and kills him there. Having thus gained the victory, he makes it his own habitation. From this he goes out a hamster-hunting, and having found one, he seizes him so strongly that he drags him away and preys upon him.

Even this circumstance shows the wisdom of the Divine Providence. This animal is in hostility with all others, and yet the species is preserved ! Every creature is an object of the care of Divine Providence, because necessary to the perfection of the whole. The hamster may be objected to because destructive ; but were there not such creatures, God would not cause the earth to bring forth so plentifully. For these he makes a provision in our fields, and they can consume no more than he has provided for them. At times they may become a scourge ; but when we balance our gains with our losses, we shall find, on the most scrupulous reckoning, that we have sustained no damage ; so that, instead of blaming the divine government, we shall have much reason to adore it. After all, what are the few pounds of corn which the hamster carries away from our fields, in comparison of the thousands of bushels which we collect there ?

SUPERSTITIOUS OPINIONS RELATIVE TO THE DESIGN OF  
THE ANIMAL KINGDOM.

It is astonishing that persons should be still found, over whose minds superstition has so much influence as to represent the most excellent and beneficent of Beings as a tyrant, and the gracious works of his hands as so many scourges to mankind. Yet examples of this kind have not been wanting in all ages, and even the present enlightened one is not a little disgraced by them.

When mice, for instance, become very numerous in Norway, the inhabitants keep what they call a mouse-feast, which consists in putting on their best apparel, and instead of engaging in any kind of work, they lie down and sleep! Again, when that species of insect called the grub-worm crawls about, the people spread their garments in the way, and look upon it as a happy omen if this army of grubs, which defile every thing by a glutinous matter which transpires from their bodies, should crawl over them. But should this crawling legion go round them, and leave the clothes untouched, it is considered as a very bad omen indeed.

When the well-known insect, the sphynx atropos, called death's-head, from its having the exact resemblance of a human skull on its thorax, is seen flying about in great numbers in the evening, it is considered, in certain places, where dark superstition still reigns, as foreboding a great mortality both among men and cattle.

What a series of misfortunes has been predicted from the gall-nut, which grows upon the leaves of the oak, in which is always found a creature in the form of a grub, a spider, or a fly! Each of these insects has been made the prophet of some particular disaster. The grub proclaims famine; the spider, contagious disorders; and the fly, war! Although these apparently different animals are but the same insect under different forms!

That ticking sound in walls, about beds, old furniture, &c., which, from its resemblance to the sound of a watch, is called the death-watch, is considered among the vulgar a certain forerunner of death.

When we examine this ominous business more closely,

we find the noise to proceed from the female of that insect called the *ptinus pulsator*, which usually, in the night-time, gives seven, nine, or eleven distinct strokes with its head against the side of the hole in which it lodges, in order to attract the male!

In a fine summer morning, when walking out, we often perceive something resembling a black powder strewed upon the ground, on which, if we attempt to tread, it appears to dance and skip about in all directions. The vulgar in certain places consider this black dust as no less than the effect of witchcraft; and whenever they perceive it, run with all speed out of the way, and take the most circuitous route, rather than attempt to pass through it, lest they should fall under the power of sorcery. But what is it that thus terrifies and causes them to run? Only that kind of insect, adhering sometimes to plants, commonly called the earth-flea.

These examples, the number of which might be greatly multiplied, are considered by superstitious people as means intended for their conversion. But it is to be hoped that the above considerations will at least show them that they have been long and often mistaken in their interpretations of natural things, and have become their own tormentors by the false opinions which they have formed concerning them. The means of salvation, and the warnings to prepare for death, are sufficiently furnished by the unerring word of truth; and the whole of the moral government of the world is continually regulated and ordered by a wise Providence that can never be mistaken, and in no case ever left to the fortuitous circumstance of a fly depositing its egg upon an oak-leaf, or to the casual noise made by an insect in decayed wood.

From such circumstances as these, we may see the necessity of enlarging our knowledge of nature, and of meditating more on the wisdom and goodness of the Creator. The more these are considered, the more we shall be convinced that God has made all things for the manifestation of his perfections, and the comfort and happiness of man; and that all his works, both in heaven and in earth, though in some cases they may at first view appear evil to us, are nevertheless perfect and

good in their respective kinds, beyond the possibility of amendment.

## AUGUST IX.

### CONTEMPLATIONS ON A MEADOW.

YE gloomy and majestic woods, where the fir-tree rears its stately head, where the tufted oaks spread their foliage; and ye rivers, which roll your silver streams among the grey mountains; it is not you which I mean this day to admire; but the verdant enamel of the meadows shall be the subject of my meditations.

What beauties present themselves to my view; and how diversified are they! Thousands of vegetables, and millions of living creatures! Some flutter from flower to flower, while others creep and crawl through the dark labyrinths of the tufted grass; infinitely varied in their form and beauty, all these insects find here both food and happiness. All inhabit this earth, as we do; and how despicable soever they may appear, each is perfect in its kind.

How soft the murmur of the limpid stream which flows through the water-cress, the trefoil, and the clover, whose purple or blue flowers are agitated by the motion of its little waves. Both its banks are covered with thick grass interspersed with flowers, which, bending over the brink, trace their image in the water.

I now stoop down, and look across that forest of waving herbs; what a mild light the sun pours on the different shades of green! Delicate plants interweave themselves with the grass, and thus mingle their tender foliage; or else they rear their stately heads above those of their companions, and display the flowers which have no perfume; while the humble violet grows upon the dry banks, and diffuses the sweetest exhalations around. Thus we see the useful and virtuous man in poverty, while the great and the rich, clothed in superb attire, consume in idleness the blessings of the earth.

Winged insects pursue each other through the grass; sometimes I lose sight of them in the verdure, and some-

times I lose sight of them in the verdure, and sometimes I see a swarm dart up into the air, and sport in the rays of the sun.

What is that variegated flower which waves near the brook? How lively and beautiful are its colours! I draw near and smile at my mistake; a butterfly leaps off, and leaves the blade of grass on which it perched, and which bent under its weight. In another place I perceive an insect covered with a black cuirass, and adorned with brilliant wings; it comes buzzing to perch on a blue-bell, probably, by the side of its companion.

What other buzzing is that I hear? Why do those flowers bend their heads so? It is a swarm of young bees. They have lightly flown from their distant home, to disperse themselves over the gardens and meadows. Now they collect the sweet nectar of the flowers, which they will by and by convey to their cells. Among them an idle citizen is not to be found. They fly from flower to flower, seeking their booty, and hide their velvet heads in the calix of flowers, or pierce with labour through those which are not yet opened.

There, on a high stalk of clover, a butterfly is perched; it shakes its variegated wings, and adjusts those brilliant feathers which compose its crest, and seems proud of its charms. Beautiful butterfly! make the flower bend which serves thee for a throne, and contemplate thy rich dress in the mirror of the waves. Thou wilt then resemble a young beauty, admiring herself in the glass which reflects her charms. Her garments are less beautiful than thy wings, but she is as giddy and thoughtless as thou art.

See this little worm running on the green turf; all the researches of luxury, all the art of man, cannot imitate the green sprinkled gold which covers its wings, where all the colours of the rainbow sport.

"O how beautiful is nature! Grass and flowers grow in abundance, the trees are covered with leaves; the gentle breeze salutes us, the herds find pasture, the tender lambs bleat, skip about, and rejoice in their existence.

"Thousands of green blades rise up in this meadow; on each point hangs a drop of dew. How many primroses are here assembled! How do their leaves tremble!

What harmony in the note of the nightingale from yonder hill! Every thing expresses joy. Everything inspires it. It reigns in the vallies and on the hills, on the trees and in the thickets! O how beautiful is nature!"

Yes, nature is beautiful, even in its smallest productions. He who feels no delight at the sight of its charms, because he is a prey to tumultuous passions, pursues false blessings, and deprives himself of the purest pleasures. Happy he, whose innocent life glides away in the contemplation of the beauties of nature. The whole creation smiles upon him. Joy accompanies him whithersoever he goes, and under whatever shade he rests. Pleasure springs up for him in every fountain, exhales from every flower, and resounds from every grove. Happy he, who is delighted with those innocent joys! His mind is serene as the calm summer day; his affections are as gentle and pure as the perfume which the flowers diffuse around him. Happy he, who in the beauties of nature traces out the Creator, and consecrates himself wholly to his God!

## AUGUST X.

### MISCHIEF OCCASIONED BY ANIMALS.

It is distressing to see so many productions of nature, and often these the most beautiful, exposed to the ravages of animals. Every summer we may see much damage, especially in the vegetable kingdom, occasioned by the rapacity of different kinds of birds, insects, &c. How many trees are destroyed and fruits consumed by worms, may-bugs, and caterpillars! Of how many things, necessary to our subsistence, are we deprived by the insatiate sparrow, and the no less voracious raven! How afflicting to see a whole field destroyed by rats or locusts! These and similar complaints are often made; and people fancy that certain animals exist only to torment mankind. There is some foundation for these complaints; and experience proves that there are animals which are injurious to men as well as to plants. It is

more easy to exterminate wolves, lions, and other ferocious beasts, than to destroy insects, when their numerous troops cover a country. In Peru, a species of ant, called chako, is a terrible scourge to the inhabitants; even their lives would be in danger if they did not use precautions to deliver themselves from these formidable insects. The devastation made on fruit-trees by caterpillars, and in fields by mice, is well-known.

But however real these inconveniences may be, they do not authorize such bitter complaints as those we make—complaints in which self-love has too great a part. We are pleased to see that the creatures which injure us destroy each other, and we think we may, without injustice, take away the lives of such animals, whether for food, or for any other purpose; but we cannot bear that they should take anything away from us: we expect that they should contribute to our subsistence, and yet we will allow them nothing! In reality, have we any more right over the life of a gnat, than it has to a drop of our blood? Besides, in complaining of the voracity of animals, we do not consider that this arrangement of nature is not so disadvantageous as it appears. To be convinced of this, let us consider the animal kingdom collectively. Such a species as appears noxious, is notwithstanding of real use, and it would be dangerous to endeavour to destroy it. Several years ago some inhabitants of the then English colonies in America endeavoured to extirpate the whole race of jays, because they imagined that these birds did much injury to the corn. But in proportion as the number of jays decreased, people were astonished at the enormous ravages which a prodigious number of worms, caterpillars, and especially may-bugs, made in the fields. Speedily the persecution of the jays ceased; and as they multiplied, they put an end to the plague, which was the consequence of their destruction.

Some time ago, a project was formed in Sweden to destroy the crows; but it was observed that these birds are not only fond of seeds and plants, but that they destroy those worms and caterpillars which consume the leaves and cut the roots of vegetables.

In North America, the sparrow was persecuted with



the utmost fury, and the consequence was, that the gnat multiplied so much in the marshy countries, that they were obliged to leave whole tracts uncultivated.

Pheasant-hunting is so considerable in the isle of Pro-cida, that it caused the king of Naples to prohibit the use of cats to the inhabitants. At the end of a few years it was found that the rats and mice multiplied to such a degree as to occasion great mischief; so his Neapolitan Majesty was obliged to revoke the decree that prohibited the use of cats.

And why should we be so selfish as to envy those creatures that small portion of our provisions which is necessary for their subsistence? Can we consume all the productions of nature? Have we any deficiency of the things necessary for our comfort and support, on the account that the birds, mice, and insects assist us to consume the blessings which God has granted to us in such abundance, and of which a part would be spoiled if these creatures did not feed upon it? Instead of abandoning ourselves to unjust complaints, let us rather, in this, acknowledge the wisdom of our Creator. All is connected in the vast empire of nature; no creature in it is useless; none is formed without design; although the use of several may be unknown to us. Their existence itself is sufficient to convince us that they were created for the wisest purposes. Thus the sight of the apparent destructions and disorders in nature should make us look up to God, who has created nothing in vain, and who preserves nothing without reason; and if he permit anything to be destroyed, it is not without a wise design. Were we deeply convinced of these truths, all the works of God would excite us to glorify and bless him.

## AUGUST XI.

### VARIETY OF COLOURS.

WHEN we consider how dull and gloomy the gardens and fields would be, and how confused all objects must appear, were there only one colour, we must acknowledge the wisdom and goodness of God, who, by making

such a variety of tints, has designed to multiply and diversify our pleasures on earth. Had he not designed to place us in an agreeable habitation, why should he have adorned all its parts with such diversified and beautiful paintings? The sky, and all those objects which are seen at a distance, are painted at full length. Splendour and magnificence are their characteristics. But lightness, delicacy, and the graces of miniature are found in all those objects which are designed to be seen near; such as foliage, birds, flowers, insects, &c.

But whence is this distinction of colours? Each ray of light appears to be simple; but by refraction it is divided into several, and hence arise different hues. A glass filled with water, and exposed to the sun, reflects certain colours upon white paper. But angular glasses, called prisms, well cut and polished, reflect more vivid colours. We may imitate the finest rainbow, and bring it close to us, if we hold a prism opposite the sun; or if, through a small hole in a window of a close-shut chamber, we receive a ray of light on a prism. According as the refraction of the ray is more or less strong, the colours will be more or less bright. The most refrangible ray is the violet, and consequently it is the weakest. After this comes the indigo, then the blue, next the green, then the yellow, next the orange, and lastly the red, which of all the rays of light has the least refrangibility.

The nature of coloured bodies contributes to the variety of colours. The smallest particles of all bodies are transparent. Hence it is that they break, absorb, or reflect the rays, sometimes in one way, and sometimes in another, after the manner of prisms. Besides, what proves that colours are not inherent in bodies is, that the neck and feathers of a pigeon or peacock, and even changing stuffs, such as taffetas and other silk stuffs, change colour according to their different positions. This may enable us to understand whence the diversity of colours proceeds. The whole may be reduced to this: the surfaces of all bodies are composed of extremely thin laminæ, which, according to their thickness, reflect certain coloured rays, while they admit or absorb others in their pores. Thus when a body, whose surface is

smooth, reflects, and throws back almost all the rays of light, it appears white; and when, on the contrary, it absorbs them, it is black.

Let us here admire the wisdom and goodness of God; if the rays were not divisible, and if they were not differently coloured, all would be uniform, and we could distinguish objects only by reasoning, and by the circumstances of time or place. But how tedious and perplexing would it be to be obliged, on all occasions, to have recourse to reasoning, in order to distinguish one thing from another! The whole of our life must then be employed, rather in studying than in acting; and we should be for ever in a state of uncertainty. Were there only one colour on the earth, our eyes would soon be fatigued with it; and this constant uniformity would cause us more disgust than pleasure. But the different colours which God has produced serve to diffuse more beauty over the earth, and to afford pleasures ever new to our eyes. This is a fresh proof that God is always employed, not only to provide for our necessities, but also for our gratification; and that, in the formation of the world, he has studied, not only the essential perfection of his works, but also to give them all those ornaments which might enhance their value. In the mixture and different shades of colours, utility and beauty are ever connected. As far as our sight can reach, we always discover new charms in the fields, valleys, and mountains. All minister to our pleasures, and all should excite our gratitude to God.

## AUGUST XII.

### THE BUILDINGS OF THE BEAVER.

**IF** a man who had never heard of the industry of beavers, and their manner of building their houses, were shown some of their edifices, he would doubtless suppose them to be the work of several eminent architects. Everything is wonderful in the labours of those amphibious animals. The regularity of the plan, the size, solidity, and admirable contrivance of their buildings,

must fill every attentive observer with astonishment. The beavers choose a place to build on where they can have plenty of food, and a river out of which they may form a lake to bathe in. They begin, first, by constructing a dike or bank, which keeps the water level with the first floor of the building. This dike or bank is sometimes a prodigious work, from six to twelve feet thick at the foundation: it is made sloping, and diminishes insensibly, till it is but about two feet in breadth at the top. The materials of this dike are wood and clay. The beavers cut pieces of wood as thick as a man's arm with astonishing facility. They fix one end of these in the earth very near to each other, and interweave them with other pieces, smaller and more pliant. But as the water may run through, and leave their watering-place dry, they have recourse to clay, which they well know where to find, and with which they fill up all interstices, both within and without; so that the water cannot possibly pass through. In proportion as the water rises, they continue to raise their dike.

Having finished their dike, they begin to work at their houses, which are round or oval buildings, divided into three stories, raised one above another. One of them is below the foundation of the dike, and generally full of water; the two others are above. They fix these little buildings in a very solid manner on the brink of their pond, and always by stories; that, if the water should rise, they may be able to lodge higher up. If they find a little island near their pond, they build their houses on it, which is then more solid; and they are less incommoded with water, in which they cannot remain long at a time. If they do not find this convenience, with the assistance of their teeth they bury stakes in the earth, in order to support their building against the winds and the water. At the bottom they make two doors, to go out into the water; one leads to their building-place, the other to the passage which leads to the place where they deposit everything that might defile their upper apartments. They have a third door at the top, for fear of being taken when the ice blocks up the lower doors. Sometimes they build their houses entirely on dry ground, and make ditches from five to

six feet deep, to go down into the water. They use the same materials and the same industry for their buildings as for their dikes; the walls are perpendicular, and are about two feet in thickness. They cut off with their teeth the ends of the sticks which project from the wall; then, mixing clay with dry grass, they make a composition, with which they plaster the inside and outside of their building: in this work their tail serves instead of a trowel. The inside of the house is arched, and the size of it is regulated by the number of the inhabitants. Twelve feet long, by eight or ten broad, is a space sufficient for eight or ten beavers. If the number be greater, the building is enlarged in proportion.

The instruments which the beavers make use of are four strong and sharp teeth; the two fore feet, the toes of which are separated; the two hind feet, the toes of which are connected by membranes; and their tail, which is covered with scales, and resembles a large oblong trowel. With these few simple tools they outdo our masons and carpenters, with all their apparatus of trowels, squares, axes, saws, &c. With their teeth they cut the wood with which they construct their buildings, and that which they provide for their food. They use their fore feet to dig the ground, and to soften and knead the clay. Their tail serves in place of a hod, to carry the mortar or clay, and afterwards as a trowel, to lay on and smooth the plaster.

The works of beavers have the nearest resemblance to those of men; and if we were to judge by the first impression they make on us, we should imagine them to be the produce of reason and reflection. But if we examine them more closely, we shall find that in all their architecture these animals act, not by reflection, but according to innate instinct. If they were directed by reflection, they would build differently now from what they did formerly, and would continually improve. But we see that they continually follow the method of their ancestors, and never go out of the circle which nature has prescribed to them. Thus, the beavers of this present time build exactly in the same way that those did who lived before the deluge. But this should not prevent our admiration; as of all the animals which

live in a social state, they come the nearest to the human race. We have only to see them, to be convinced that beasts are not simple machines, and that a spiritual principle directs all their motions and actions. But what an infinite difference has God put between the faculties of animals! How vastly superior is the instinct of the beaver to that of the sheep! And what divine wisdom is manifested in the gradations by which brutes insensibly approach to the human species! May we profit by the discoveries we make of the different faculties of animals, and use them to improve ourselves more in the knowledge and love of the Creator of all beings!

### AUGUST XIII.

#### THE MANNER IN WHICH THE NUTRITION OF THE HUMAN BODY IS EFFECTED.

OUR aliments are composed of two parts; that which is properly nutritive, and should continue in the body, and that which is not nutritive, and should be expelled from it. In respect to both, it is necessary that the food we eat should be well ground, and its parts separated. This is begun in the mouth by mastication or chewing. The *dentes incisores*, or fore-teeth, cut and separate the pieces; the *dentes canini*, or side-teeth, tear it; and the *dentes molares*, or double teeth, grind it small. The tongue and lips contribute also to this, by keeping the food under the teeth as long as it is necessary. Certain glands being compressed in the act of chewing, throw out the saliva which moistens the food, penetrates and renders it easy to separate its parts, and contributes to the digestion. Hence the great necessity of properly chewing the food before it is taken into the stomach.

The aliments, thus ground small, moistened, mixed, and partly elaborated, are taken into the pharynx, and pass through a canal, where there are glands which continually furnish a certain liquor, which lubricates it, and renders the passage of the food more easy. If this happen to be too dry, the sensation of thirst tells us that we should drink. The food follows thus the course of

the œsophagus, till it descends into the stomach. This is provided with a glutinous liquor, and another juice still more active, both of which bear the name of the gastric juice. These serve to ferment and concoct the aliments. When the stomach has been too long empty, this gastric juice irritates its nervous coats, and produces that sensation which we term hunger. The stomach is always in motion, by the contraction of its fibres up and down, so that its cavity is strengthened, and the two extremities drawn towards the centre so that the whole is equally contracted: the aliments then, finding the passage through the pylorus easy, descend through it into the intestines. It might be supposed, from the contraction of the stomach mentioned above, that they would be as liable to return through the œsophagus as to descend through the pylorus; but this is prevented by a valve which closes the passage of the former.

The intestinal canal is properly a continuation of the stomach. In this canal there is a constant motion, called the peristaltic motion, by which the whole alimentary mass is agitated above, below, and on all sides. The aliments, by the preceding operations, are reduced to a kind of soft paste, which continues long enough in the intestines, and advances slowly by means of their vermicular motion. This paste is afterwards mixed with the bile, which is separated by the liver, and serves to secrete the chyle and dissolve the aliments. In all the intestines the orifices of certain extremely fine vessels are discovered, which are termed the lacteals. The whitest and purest part of the alimentary mass passes through these vessels, which pour it into one much larger; by which it ascends above the breast, and is thrown into the veins. It then loses its white colour, and by its mixture with the blood and other juices becomes red. The nutritious juice, prepared and perfected thus in the veins and glands, is conducted by a multitude of canals into the different parts, where it is necessary for the nutrition and preservation of the body. As to the gross and innutritious part, which is found in the large intestines, it passes from the cæcum into the rectum, and accumulates in this latter intestine, till at a proper time it is expelled by the action of the organs.

Behold what a variety of operations are requisite to accomplish one of the necessities of the body! How many parts and organs must concur and labour, in order to provide the necessary nourishment and growth for the whole! It is by the intimate relation and connexion which subsists between the external parts of our bodies, that the digestion of the food and secretion of so many different juices must be effected. What is most admirable is, that all the parts of our bodies which are thus exercised to effect its nutrition serve also for other purposes. The tongue, for instance, contributes to mastication; but it is also the organ of speech and taste. The organs by which the body throws off its acrid and superfluous humours serve also for the propagation of the human species. In a word, there is not one member of our bodies which has only one office. And this is certainly a striking proof of the infinite wisdom of the Creator. Let us think of these things at our meals, and endeavour to make them, in some sort, the subject of our conversation. This will afford us a rich fund of useful matter; and by acting thus, we shall follow the sage advice of the apostle, "Whether ye eat or drink, or whatsoever ye do, do all to the glory of God."

## AUGUST XIV

### NATURE CONSIDERED IN DIFFERENT POINTS OF VIEW.

THE works of nature, so superior to those of art, are particularly so in this, that their admirable variety always furnishes new subjects of astonishment and pleasure. We look once or twice at a work of art, and supposing we do return to it oftener, we at last grow tired, and either look no more at it, or see it with a certain degree of indifference. But when we attentively examine and reflect on the works of nature, our mind is never fatigued; we ever find new charms in them, and could continue the contemplation for ever.

If we consider nature in its most majestic and sublime point of view, with what astonishment are we struck in viewing the immensity of the heavens; the in-



numerable multitude of the stars, and the immense extent of the sea! Compared with these, all the works of art, however great and excellent they may be, are insignificant, and of no value. All that God has made, and all he does, is stamped with a grandeur which surpasses all our ideas and conceptions. To give us an idea of his infinity, he had only to form the sky. This shows the magnificence and grandeur of the Creator better than all the earth contains. Is there anything more proper to inspire us with profound veneration for God, than to contemplate him in these immense works. With what ecstasy and religious fear should we feel ourselves penetrated when we view these great phenomena of nature, which no creature could produce, such as earthquakes, volcanoes, storms, and tempests! These grand scenes of nature are sometimes exhibited before us; and there is none of them which ought not to make us feel the excellence and majesty of the Creator of the heavens and the earth.

Nature presents itself also in a pleasing point of view; we see vallies adorned with verdure, and beautiful flowers; fields which promise plentiful crops; mountains covered with trees, vines, and all sorts of simples and medicinal plants. In all these smiling scenes, God shows himself the Friend and Benefactor of men: he opens his liberal hand, and satisfies everything with his bounty. This is the season when everything furnishes the most convincing proofs of his goodness: at present everything conjoins to delight and flatter our senses, to please and to nourish us.

But the time will soon come in which nature will show itself under a sad and gloomy form. It will speedily lose a part of its beauty and variety; and resemble a desert, which promises neither riches nor pleasure. Each day brings us nearer to this gloomy season; and the insensible decrease in the length of the days begins already to inform us that we must soon confine ourselves to our apartments. But, even under this form, nature has her attractions; for winter also concurs to the perfection of the world; and without it we should be deprived of the pleasures which spring and summer afford.

Let us apply these reflections to our life. It also is

subject to variations, and is continually assuming new forms. To the most beautiful and flattering scenes, the most melancholy and distressing often succeed. In prosperity, let us prepare for adversity; and glorify our God in every situation in life.

## AUGUST XV

### DAMAGES WHICH MAY BE OCCASIONED BY RAIN.

MODERATE rain always contributes to the growth and fruitfulness of plants; and consequently is a great blessing to the earth. But in many respects it may become injurious to vegetables first, when it falls too vehemently; and secondly, when it continues too long. When it is too violent, it buries the small delicate plants in the earth; and when too long, it prevents their growth. A superabundant moisture deprives them of the necessary heat; the circulation of the sap is interrupted; the secretions are not properly performed; and the plants droop, and are in danger of perishing.

But this is not the only way in which the rain may become injurious; although it is the most common. Sometimes it makes terrible havoc. When many clouds, driven by impetuous winds, meet with towers, mountains, and other high places in their way, they burst, and suddenly pour out the water with which they were laden. This must occasion great devastation; for as water is not very compressible, it must, when pressed down, run suddenly out, and fall with the greatest violence from mountains and other heights. Therefore, it is not astonishing if it drag along great stones, beat down trees, and overthrow buildings. Two causes concur to render these effects more violent: on one hand, the great quantity of water which is precipitated; and on the other, its velocity, augmented by the height from which it falls;—the action of a moving body being always in proportion to the quantity of matter in the body, and the degree of velocity impressed on it.

Waterspouts are still more formidable: their figure is that of an inverted cone; the base terminates in some

cloud ; their point is turned towards the earth. These waterspouts attract and draw up everything they meet with in their way, which is afterwards dashed down in the fall of the water. If the point of this pyramid reach the sea, the water boils, froths, and ascends with a terrible noise. But if it fall on ships or buildings, it shatters and throws down the latter, and shakes the former so violently that they often founder. According to all appearance, this meteor is formed by the action of winds which blow in contrary directions, and which, meeting with many clouds in their passage, drive them with violence against each other. When these opposite winds strike a cloud sideways, they necessarily give it a circular motion, and cause it to turn with rapidity ; and in this circular motion they take the form of a whirlwind ; and their weight being suddenly increased by the force of pressure, they fall with impetuosity, and in their fall assume the figure of a column, sometimes conic, sometimes cylindrical, which turns round its centre with great rapidity. Their violence is in proportion to the quantity of water which falls at once, and to the velocity of the fall.

Cataracts and waterspouts are always dangerous. Fortunately the latter seldom takes place on land ; but they are frequent at sea. As to cataracts, the mountainous countries are more exposed to them than those which are flat and level ; and they happen so seldom, that many years escape before an acre of land is destroyed by them. However this may be, it is very unjust, when these disasters happen, to murmur against God, and abandon ourselves to complaining and distrust. Many people are grievously afflicted by these events ; they view them on the darkest side, and their imagination magnifies and multiplies the object. When a little corner of the earth, which is but a point in comparison of the globe, has been ravaged by a waterspout or any other accident, we complain, as if all nature were in danger of perishing ; and, absorbed with these local and transitory disasters, we forget the innumerable blessings which God diffuses over the earth, and which vastly exceed these judgments, which very rarely occur. If we were just, we should be more affected with the

order and universal happiness which result from the present arrangement of nature, than with those partial disorders which spring out of the ordinary course of things, and which should be considered only as exceptions to a general rule. Would it not be equally unjust and ungrateful to pay attention only to the earthquakes, tempests, and inundations, which happen upon an average but once in many years, while we forget so many daily blessings, and innumerable benefits, resulting from the constant and regular return of the seasons? Do we not sin against God when we calculate the damage which some transient accidents occasion, and take no account of the vast advantage which we daily enjoy through the present arrangement of nature? Let us never more render ourselves capable of such base and criminal ingratitude. Let us rather consider the works of God with humility and admiration, and endeavour to form just and suitable ideas of them. For, doubtless, there are infinite wisdom, order, and goodness even in those things where we can scarcely see any traces of them; but which will unfold themselves to us more and more, if we endeavour to study nature with an attentive and religious mind.

## AUGUST XVI.

### PARENTAL CARE OF ANIMALS.

THE most remarkable instinct with which God has endued the minds of brutes, is, doubtless, that which they manifest in the preservation of their young. Few animals abandon their eggs or young to chance. Their self-love, on the contrary, extends to their posterity; and that in the most solicitous manner, and in a way the most suitable to their different species and modes of life. Some of those little creatures which come out of the eggs of fish and insects have no need of being hatched by the parent, as the heat of the summer is sufficient to animate and strengthen them, and they are capable of providing for themselves from the moment of their birth, supposing they are in a suitable place, and have food

within their reach. The greater part of insects do not live long enough to see their posterity. Fish and amphibious animals cannot distinguish their own young from others of the same kind. Nevertheless, nature inspires them with a knowledge of the best means to provide for the principal wants of new generations. Fish come in shoals to deposit their eggs near the coasts ; where the water, being shallow, is easily warmed by the heat of the sun ; where they may be more easily hatched, and afterwards find requisite food.

Amphibious animals come out of the water, and lay their eggs in the sand, that they may be hatched by the heat of the sun ; as they know that their young will readily find their true element, and the place where they are destined to live and seek their food. Gnats, and other insects which are born in the water, but live in the air or on the earth, never fail to lay their eggs where the life of their young should commence. Insects which fly upon the earth, and which in general require no food for themselves, still take care to deposit their eggs on plants, fruit, flesh, and other substances which are proper to nourish their young. There are some which pursue other animals, that they may lay their eggs in their skin, hair, mouth, and entrails. Some animals deposit their eggs in nests, or cells, which they have prepared, and into which they have carried beforehand suitable provision for the nourishment of their young.

Other animals, which cannot provide for themselves as soon as they are born, are intrusted to the care of their parents. How great is the solicitude of birds, even before they lay their eggs ! Every species has its peculiar mode of constructing its nest. With what patience and constancy they sit on their eggs for several weeks, scarcely taking time to eat their food ! What care do they take to warm their young when they are hatched, and to provide suitable food for them ! What courage do they show in defending them, and securing them at the hazard of their own life ! Is it not also a very singular instinct in quadrupeds, to cut with their teeth the umbilical cord of their young, and to do it also with the necessary precautions that they may not lose too much blood ! With what tenderness and attention do they

suckle them, give them warning of danger, and protect them from it !

In general, the instinct of animals for the preservation of their young is stronger than the desire of satisfying their own wants. They suffer hunger and thirst, they refuse sleep and all conveniences, and even hazard their own lives, rather than neglect their little ones. In this instinct which God has given to animals, we may see such wisdom as we can never sufficiently admire ; for the preservation of every species depends on the care which the parents take in hatching and providing for their young. We need not be surprised that viviparous animals should feel affection for their young ; they are their own flesh and blood : but that those which are oviparous should feel such solicitude for their eggs, is absolutely inexplicable. The eggs have a widely different figure from the parents ; and in no respect resemble an animal. Besides, the eggs are not visible when the birds begin to build their nests, and when the insects seek places where the new generation may find subsistence.

Adorable Creator of all that exists ! who would not in this admire thy wisdom ? Who would not acknowledge that goodness with which thou watchest over the preservation and propagation of the animal kingdom, that they may minister to our wants, and to our pleasure ? Open our eyes, that we may acknowledge more and more the wisdom which shines through all thy works !

## AUGUST XVII.

### VARIOUS KINDS OF EXTRAORDINARY RAIN.

EVERY phenomenon, however natural and useful it may be, is often a cause of terror and dismay to ignorant and superstitious men. We see a proof of this in the rains which superstition considers as supernatural, and which terrify so many people.

Who does not tremble when he hears of a shower of blood ? Sometimes, and particularly in summer, there

falls a reddish rain, to which this name has been given; or rather, it is supposed that such a rain has fallen, when, after a shower, we find drops tinged with a red colour in the fields. Many believe that such a rain has fallen from the sky, and that it is properly blood. When this is considered, it is no wonder that such rain should be attributed to supernatural causes. There is nothing in it, however, but what is very natural. For the atmosphere being laden with different substances, and with a multitude of foreign matter, we need not be surprised that the rain sometimes partakes of this mixture, and that its natural colour and qualities are changed. It may very easily happen, that coloured particles may fall with the rain. The wind may raise up, and disperse far and wide, the coloured stamina of different flowers, and even the red excrement of certain butterflies. There are also little red insects on the face of the water, which credulous people may take for blood. Sometimes, also, a certain viscous humour, produced by fatty, reddish particles, which float in the air, falls with the rain, as happened in Westphalia and other places, in the year 1764. But so far from their being anything marvellous in this, we may rather, on the contrary, be astonished that these phenomena do not happen more frequently.

It is the same with those showers of sulphur which are said to fall often. This rain is not properly sulphur, although it is possible that the atmosphere being filled with sulphureous particles, some may be detached with the drops of rain. But it has been proved by a number of experiments, that these showers are no other than the flowers or coloured seeds of some plants, or fine sand, or yellowish dust, which the wind raises in some countries, and mingles with the rain. The supposed showers of wheat are produced in the same way. When heavy rain falls in those parts where muchcelandine grows, it lays bare the roots, which are very slender; the little bulbs which adhere to them are separated and scattered about, and these are taken for wheat fallen from above; and superstitious people believe this to be a presage of dearth and famine.

But whence come all those caterpillars with which the gardens and fields are sometimes strewed when a shower

of rain has fallen? Nothing can be more natural than this. As the atmosphere contains a multitude of bodies of every kind, it is very likely that both insects and their eggs may be found there. The latter only require a place to be hatched in, consequently when they are brought down with the rain they stick to the leaves, and then come to life. That this is possible the following fact proves, related by writers of the utmost probity. The rains which fall in Philadelphia during the month of August bring with them insects which, when they stick to the human skin, and are not immediately taken off, bite and produce great itching. And when these little animals happen to fall upon woollen cloth, they stick in it and multiply like moths.

We are under very great obligations to those naturalists who by their researches and experiments have exposed and rooted up so many superstitious opinions and prejudices. It must, however, be confessed that the common people are full of them still; and this proves that men have in general a greater propensity to error than truth, and that they are not convinced as they should be of the wisdom and goodness of the divine government. Let us not dishonour both our God and our reason by these or similar prejudices. Let the conviction, that everything is well ordered in nature, and that God proposes infinitely wise ends, be a source of joy and consolation to us. Let us leave superstitious ideas to pagans and infidels; but let us, who have the happiness of knowing the true God, glorify him by our faith, honour him by confiding in his goodness, and labour more and more to diffuse reason, wisdom, and piety among men.

## AUGUST XVIII.

### SENSIBILITY OF PLANTS.

WE may observe certain motions in plants which make it doubtful whether they have sensibility or not. There are vegetables which draw back and contract their leaves when touched. We see some which open and shut their



flowers at certain fixed hours of the day ; so that these plants show the hour of the day with great exactness. Others assume a very singular form during the night, as they then fold up their leaves ; and these motions take place whether they are in the open air or in close apartments. Those which always live under the water, raise their leaves above it in the time of fecundation. The motions of a marshy plant, which was discovered some time ago in the province of Carolina, are still more singular. Its round leaves are garnished above and on the edges with a multitude of notches, which are extremely irritable. When an insect chanced to creep on the upper surface of the leaf it folds up, contracts, and shuts up the insect till it dies. Then the leaf opens of itself. We may daily observe certain regular movements in some garden plants. Tulips expand when the weather is fair but they shut up in the time of rain, and after sunset. Vegetables with husks, such as peas and beans, open their shells when dry, and curl up like shavings of wood. Wild oats, when put on a table, will move of themselves, especially if they have been warmed in the hand. And do we not observe that the heliotrope or sun-flower, and various other plants, always turn themselves towards the sun ?

These are incontestable facts, of the reality of which any person may be readily satisfied. From these some conclude that we cannot deny sensibility to plants ; and it is true that the above cited facts give some probability to this opinion. But, on the other hand, we do not discover any other mark of sensibility in plants. All in them appears to be absolutely mechanical.

We plant a shrub, and destroy it, without observing any analogy between it and an animal. We see a plant bud, blossom, bear seed, as we see the hand of a watch run insensibly round all the points of the dial. The most exact anatomy of a plant can show us no organ which has the least relation to the organs of animal sensibility. When we oppose these observations to those whence some have inferred the sensibility of plants, we remain in uncertainty, and know not how to explain the phenomena related above. Perhaps all we observe relative to the motions of plants proceeds only from the

structure of different fibres, which sometimes contract and sometimes expand. Perhaps the subtile exhalations of our bodies cause sensitive plants to contract when we touch them. But it is probable, also, that as there are innumerable gradations in nature, there are certain plants which possess the lowest degree of sensibility, and which serve for the connecting link between the animal and vegetable kingdoms, as there is, in fact, but a short passage between the sensitive plant and the muscle. Thus sensibility may be given to plants, at least to those which approach nearest to the animal kingdom.

We see, then, that our knowledge of this subject is very imperfect, and is almost reduced to mere conjecture. We can neither attribute sensibility to plants, nor deny it, with certainty. On this subject we must rest contented with conjecture, and not seek to pass the bounds presented to our knowledge. Let us render to the Creator the glory due to his name ; and let us be persuaded that whatever may become of the question, and whatever the principle of the before-mentioned phenomena may be, the arrangements which he has made in these, and all other respects, have been dictated by unlimited wisdom and goodness. We may very well dispense with the want of more extensive knowledge on this part of the vegetable kingdom ; and though this point should ever rest problematical and obscure to us, yet what we know on the subject is sufficient to satisfy a reasonable curiosity, and excite us to glorify God. Let us, therefore, endeavour to make a proper use of the knowledge we have, without losing ourselves in speculations more curious than useful ; and without aiming at that measure of knowledge which is reserved for those who shall succeed us, or perhaps for eternity.

## AUGUST XIX.

### THE FEAR OF STORMS.

AT the season in which nature presents to our view only pleasing and delightful scenes, well calculated to inspire joy and happiness, there are still some persons

found who spend their time in complaints and murmuring. The summer would, without doubt, be delightful, say they, were it not for those storms which disturb it, and stifle every sentiment of joy in our souls. The fear of storms and thunder are principally founded on the opinion that they are the effects of God's wrath, and ministers of vengeance. For if, on the contrary, we considered how much storms contribute to purify the air from a multitude of noxious vapours, and to fertilize the earth, if we would take proper precautions against the effects of lightning, storms would cease to appear formidable, and sensible people would consider them as blessings, more proper to inspire us with gratitude than terror.

But it may be said, thunder has often made great havock. How often has lightning struck both men and beasts, and consumed whole villages and towns! This is all true; but in this, as in many other cases, a terrified imagination greatly magnifies both the evil and the danger. To show how little likelihood there is of being killed by lightning, let it be observed, that among 750,000 persons who died in London, in the space of thirty years, two only were killed by lightning. Let us observe, also, that during the greatest claps of thunder many persons prolong their fear without the least reason. He who has time to be terrified, and to fear the natural effects of lightning, is already entirely out of the reach of danger. It is only the lightning that can be fatal to us. When we have seen it without being hurt, and the thunder does not immediately accompany it, it is doubly foolish to wax pale and tremble at the sound of the clap, or shut our ears for fear of a sound which cannot possibly be dangerous. What should shorten our fears, or entirely prevent them, is the consideration, that after the lightning we may wait for the thunder in the utmost safety, as it is certain it will do us no more hurt than the distant report of a cannon. Indeed the thunder tells us we have escaped the danger of the lightning, and informs us how distant it is; for the greater the interval is between the flash of lightning and the peal of thunder, the greater the distance from the seat of the storm.

The surest means of guarding against the fear of

thunder, and other terrible phenomena of nature, is to endeavour to have a good conscience. The righteous man, calm and composed, fears not the judgments of heaven. He knows that at the command of God all nature is armed against sinners. But when even the Supreme Judge terrifies and smites the obstinate, the good man knows that he is ever under the protection of the Almighty. "He hears the thunder roar, but he is not terrified. His Creator, the God whom he loves, is the Ruler of the lightning. He knows when only to terrify, and when to strike. He sports with storms and tempests, and makes use of them to convince the infidel of his existence, who dared to doubt it; and to bring terror into the hearts of the wicked. The friends of God need not tremble; it is their privilege and glory to be able to trust in him, even when his thunder roars. The time shall come when, elevated above the regions of storm, they shall walk upon the clouds by the splendour of his lightnings." Then shall they see that thunder itself is a blessing from the Lord, that he makes use of it to purify the atmosphere; and they shall praise this Supreme Being, who, by an apparatus the most formidable, condescends to provide for the necessities of the earth. With one hand he holds the thunder, and with the other he waters our fields; and thus at once shows himself both our Father and our Judge.

## AUGUST XX.

### SUMMER EXHIBITS EMBLEMS OF DEATH.

WHEN we walked a few weeks ago in our gardens, we were surrounded by beautiful and pleasing objects, and everything inspired serene delight. But at present the prospect becomes less agreeable daily, or at least more uniform. The greater part of the flowers which adorned the gardens have disappeared, and we see only their weak remains, which just serve to recall to our minds the charming scene which we enjoyed a few months ago. These revolutions in nature are very instructive. There is a time of life in which we have all the charms of

spring ; we are then admired and loved, and the most excellent fruit is expected from us. But how often is this expectation disappointed ! The blossoms fall off before they had been well expanded ; sickness robs us of our charms, and a premature death blasts all our expectations.

We observe the spring flowers, which last till summer, wither then in a few hours. A striking emblem of death ! Scarcely a day passes in which we do not hear of persons snatched away by sudden death when they least expected it ; but God has an infinity of means to put an end to our lives. It is true that habit renders us almost indifferent about the deaths of so many of our fellow-citizens, who are suddenly cut down ; and it is not less true, that the days of man are as the grass : he flourisheth as a flower of the field ; but the wind bloweth upon him, and he is gone, and the place that knew him knows him no more.

We have now reached that season in which we endeavour to screen ourselves from the scorching heat of the sun, and seek the cool shade of the grove. But are not these retreats well calculated to make us reflect on the silence and darkness of the tomb ? There we shall find rest after having borne all the fatigue and heat of the day of life.

The mower prepares to cut down his corn. The scythe brings down the stalks on the right hand and left, and leaves the fields empty and desert behind it. This should remind us of our own lot. All flesh is as grass, and the glory and duration of human life as the flower of the field. Man flourishes a while, and is then cut down, when the Lord of the harvest has given his command.

Even the bees teach this truth. When we reflect on the activity and industry with which they collect and prepare their honey, we should learn to lay up treasures of wisdom and goodness betimes, which may be a comfort to us in our old age, and at the hour of our death.

In a little time, the husbandmen will unite to collect the fruits of the earth, and deposit them in their granaries. These days of harvest are the most solemn and

the most important of all the days in the year. But, O my God! how solemn will that great day be when the Creator himself shall collect the harvest! When all the dead shall rise out of their graves; when the Supreme Judge shall say to the angels, "Gather the tares into bundles to be burnt; but gather the wheat into my garner." With what joy may the righteous meditate on this day of harvest! Here, he goeth forth weeping, bearing precious seed; but he shall doubtless come again with rejoicing, bringing his sheaves with him.

These are not the only emblems of death which nature furnishes, but they are the most striking. Every person who considers them should look upon them as pictures of the shortness and frailty of human life; and we need not be afraid of having that comfort which is so natural to us in summer lessened by such reflections as these. Meditations on death are the best means of farther embellishing this happy season, and of rendering it still more agreeable. When we contemplate death in its true light, far from considering it as the enemy of our pleasure, we shall acknowledge that the idea of death ennobles and increases our happiness. Would we run into imprudent excesses in those summer days, if the thought of death were present to our minds? Would we abuse the gifts which God grants, if we remembered that the hour must come in which we shall give an account of our stewardship? Would the blessings of this life corrupt or captivate our hearts, if we often considered that the fashion of this world passeth away? Would the burden which we have to carry during the heat of the day, and the sufferings to which we are exposed, excite murmurs, if we considered that the evening would come and bring us refreshment and rest? Would we imagine that our chief good consisted in the enjoyment of this world and its pleasures, if we accustomed ourselves to think that a better world, and more dignified pleasures, might one day be our happy lot?

## AUGUST XXI.

## CAUSES OF THE HEAT OF THE EARTH.

THE sun is, without doubt, the principal cause of the heat of our globe ; and the warmth of a particular place is owing to its relative position to the sun. When he is on the southern side of the earth, the inhabitants of the north have not such warm days as when he approaches the north pole. The same takes place in the southern parts of the earth, when the sun is turned towards the north. In those countries where the sun is nearly vertical, the cold is never so great as to freeze the rivers and lakes ; on the contrary, the heat is always great in those regions. It becomes excessive when the sun remains a long time above the horizon, so that his rays fall for a considerable time upon the same place. Hence it is, that towards the poles, where the days are very long, the heat is sometimes intense, in certain countries. When all this is considered, we must conclude that the sun, and its relative position towards the earth, is a chief cause of the heat in open air.

But this is not the sole cause ; if it were, all winters would be equally cold, and the temperature must be always exactly the same in countries situated under the same climate. But neither of these is the case : it is observed, that on the highest mountains, when even there are spacious plains, and on these plains other hills and plains, it is still much colder than in low lands and deep vallies. Even under the line, if, from a plain where the heat is excessive, we ascend a mountain 12,000 feet high, we shall feel the most piercing cold, and be in the region of snow and ice.

It has also been further observed, that in winter, when the cold has been rigorous during the day, it has sensibly abated towards midnight ; the weather became temperate, although the rays of the sun did not then influence the atmosphere. It is therefore incontestable, that there is a warmth in the air, which is not immediately produced by the sun.

There are substances which warm and take fire by percussion and by friction. The axletrees of wheels take fire when carriages run too fast, and have not been properly greased. Other substances warm and take fire when they are mixed together. If a certain quantity of water be poured on a bundle of hay or straw, a considerable degree of warmth will take place. Substances which corrupt or ferment, acquire a degree of heat which may be perceived by the thermometer, or by the touch. Even in the air, the motion of certain matters may occasion mixtures, dissolutions, and combinations, which may produce a great degree of heat. Thus we may account for the production of heat in the open air. The sun in the first place is the principal cause of it: to the heat which proceeds from this planet, that of several living creatures is united; that of fire, excited by wood, coal, and other combustible matters; that which comes out of the bowels of the earth, the depth of the sea, and from warm mineral springs. The heat is often very much increased by the fermentations which different bodies undergo; whether on the surface of the earth, or in the upper regions of the atmosphere, where they produce warm exhalations. When, therefore, all kinds of particles which float in the lower atmosphere, and which are proper to receive and preserve heat, are not cooled, or dispersed by the winds and rain, the heat increases by degrees, and becomes more and more intense. On the contrary, it is diminished when any of the above causes cease to act.

All these plans are worthy of the wisdom and goodness of God. They are useful to all parts of the habitable globe; and the Creator has assigned to all climates that measure of happiness of which they were susceptible. But we who live under a temperate climate prove very sensibly the paternal cares of the Most High. Heat and cold are distributed to us in the wisest proportion; and we should be the most ungrateful of men, did we not acknowledge and celebrate the bounty of God towards us.



## AUGUST XXII.

## VARIETY OF PLANTS.

ONE of the many things worthy of our admiration in the vegetable kingdom is the great variety observable in plants. They are diversified in respect to their parts, their generation, their productions, and their virtues.

The manner in which fructification is performed in many plants is very obscure. Little is known concerning its process in mosses, mushrooms, and ferns. There are plants which exhibit singular monstrosities. We see flowers which have no tops; there are some, out of the middle of which other flowers spring. Certain plants, which are termed sleepy plants, assume a different situation at the approach of night, to what they had in the course of the day. Some turn towards the sun; others draw back and contract when they are touched. There are flowers which open and shut at certain regular hours, or in particular states of the weather. Some grow up, flourish, bear fruit, and lose their leaves sooner than others. Plants differ also with respect to the place of their growth, some choosing one place in preference to another. All plants are originally wild; i. e., they grow of themselves without culture.

The Creator has assigned to plants different climates, suited to their nature and uses, and where they may best come to their perfection. But those which are exotics may be naturalized among us, and succeed very well, provided care be taken to procure them a degree of warmth suitable to their nature.

What delights our eyes most in plants is, their great variety of forms. Let the most perfect species be compared with those which are least so, or let the different species of the same genus be compared, and we cannot but admire the astonishing variety of models according to which nature works in the vegetable kingdom. We pass from the truffle to the sensitive plant; from the mushroom to the carnation; from the excrescence on the cherry-tree to the lilac; from the nostoch to the

rose-bush ; from the moss on the cherry-tree to the mould on the chesnut ; from the morel mushroom to the oak ; from the moss to the lime-tree ; from the miseltoe to the orange-tree ; and from the ivy to the fir.

If we consider the numerous families of mushrooms, or the different kinds of plants which are termed imperfect, we cannot but admire the fecundity of nature in the production of those vegetables which are so different in their form from others, that they can scarcely be ranked in the number of plants. If we ascend a few steps on the scale of plants, we behold with pleasure the series of plants with stalks, from the grass which grows between stones, to the inestimable plant to which we owe the principal part of our nourishment. We, in the next place, observe the vast variety of creepers, from the tender bind-weed to the vine.

What we can never sufficiently admire in the works of nature is, that the most perfect harmony prevails among this great variety. All plants, from the hyssop which grows on the wall to the cedar of Lebanon, have the same essential parts. A little herb is as complete a plant as the most perfect rose ; and the rose is not less perfect than the most stately oak. All appertain to the same monarchy ; all follow the same general laws of growth, proportion, and multiplication ; and, nevertheless, each species is distinct from the other. Among so many thousands of plants, there is not one but has its distinct characteristic properties, particular manner of receiving nourishment, of growing, and perpetuating itself. What inexhaustible riches do we discover in their forms, colours, and proportions !

They are highly privileged, who are capable of observing these varieties, and of relishing the different beauties of the vegetable kingdom. What pleasure may the human mind find in this study ! After having entered fully into the spirit of this delightful employment, we can renounce all others with ease, to make this our only study. The soul, enraptured with these delightful meditations, shall ascend to thee, O God, who art the Father of nature ! Thy power has produced all these plants ; thy wisdom has properly arranged them ; thy goodness manifests their endless variety, and affords us continual

subjects of praise and gratitude to our Creator. And can we omit a duty to which all nature invites us, without having the most insensible and ungrateful hearts? And can we indulge such a spirit, and hope for the love and approbation of our Maker?

## AUGUST XXIII.

### GENERAL REFLECTIONS ON THE ANIMAL KINGDOM.

WE may consider the animal kingdom as a well-governed state, where a proper number of inhabitants are found, and each in the place assigned to him: all have the necessary faculties for their different avocations; they are induced to fulfil their appointments by rewards and punishments, and are sufficiently protected against their adversaries. In this republic of animals, those which are small and feeble are in subjection to the strong and powerful; but all are in subjection to man, as the representative of the Deity. The inhabitants of the animal kingdom find everywhere a sufficiency of employment and food. They are dispersed everywhere, and their nature, their different constitutions, and their organs are suited to the different residences assigned them.

Their employments are various; but all tend, either to the increase of their species, to maintain a constant equilibrium between the animal and vegetable kingdoms; or to provide for their own subsistence, and to defend themselves against their enemies. We may observe, that all the parts of their bodies are adapted to their functions, and to the nature of their minds. The Creator has given them certain instincts, which compensate them for that reason of which they are deprived—instincts diversified in a thousand ways, and appropriated to their different wants: instincts for motion; instincts for food, to enable them to discern it infallibly, to find it out, to seize it, to prepare it, &c.; instincts for the constructing of nests and other necessary places of abode, to hoard provisions, and to go through their different changes; instincts for the propagation of their species, to defend and preserve themselves from their enemies, &c.

In each class of animals, there are some that live on prey, and on the individuals which superabound in other classes. Each species has its peculiar enemies: hence it is, that none can multiply too fast, and the proper balance is kept up. Sickly animals, or those which have some defect, are ordinarily the first which become a prey to the others: corrupt fruits and carcasses are devoured; and the earth is not incommoded, nor the air infected by them; and thus nature preserves its lustre, its bloom, and its purity.

Beasts of prey have a make conformable to their manner of life; they are either endued with particular strength, or great agility, industry, or cunning. But in order to prevent them from destroying whole species, they are confined within certain limits; they do not multiply as fast as other animals, and often they destroy one another, or their young become a prey to other creatures. Some sleep during the winter, digest their food slowly, and feed on the fruits of the earth, when they can get no other food. Weak animals are provided with means of defence adapted to the places of their abode, and the dangers to which they are exposed; their natural weapons, their agility, their dwellings, their scales, their cunning, preserve them from destruction: and by these means, the proper balance is always kept up in the number of every species in the brute creation.

Animals are in some measure obliged to perform the functions assigned them, because on this their happiness depends. They find their well-being in following the laws which nature has prescribed, as, on the contrary, they cannot transgress them without necessarily bringing on themselves all sorts of evils. The mammalia, or animals which give milk, are the largest, and consequently the fewest in number; but they fulfil very important offices. The functions of birds are also very much varied; they eat up superfluous grain, devour dead carcasses, and lessen the number of every species of insects.

Most amphibious animals prey on others. The smallest animals are the most numerous; and they are more vo-

racious in proportion to their size. They manure many vegetables, and serve many other useful purposes.

All the admirable things which we see in the animal kingdom demonstrate the existence of a Being who possesses all the treasures of wisdom and knowledge. Who, besides himself, could have peopled this vast globe with so many animals of different kinds; and could provide them all that was necessary for their life and their well-being? Who but God could have nourished that infinite number of creatures according to their different tastes; could have provided them with coverings, places of abode, weapons for necessary defence; and given them all so much address and sagacity, so many instincts and capacities? Who but he could have preserved the balance between so many different species and classes of animals? Who but the All-wise could have assigned to every living creature its proper element; and form that innumerable multitude of limbs, joints, bones, muscles, and nerves, joined and articulated with so much art, harmony, and perfection, that each animal may perform its different motions in a manner the most convenient, and best adapted to its way of life, and to the different situations in which it might be found?

Yes, Lord God Almighty, it is thou alone who couldst do all these things! And to thee all the glory, praise, and thanksgiving belong. It is to thee alone that we owe homage and gratitude for all that thy hands have formed. The contemplation of the animal kingdom, and the innumerable conveniences which accrue to us from it, should excite us to pay thee that tribute of love and gratitude which to thee alone is due.

## AUGUST XXIV

### THE DIVISION OF THE EARTH.

ALL the known world is divided into four principal parts, Europe, Asia, Africa, and America.

Europe is the smallest. Its length, from east to west, is reckoned above 3,600 miles, and its breadth, from

north to south, about 2,700. Its inhabitants possess many countries in different parts of the world, and have nearly one half of the earth under their subjection. The Europeans alone travel into the four different parts of the globe, and bring thence the productions of all countries. They are the most enlightened of all people, and those who cultivate the arts and sciences with the greatest success.

Europe is the only part of the earth where the land is everywhere cultivated, and the whole surface filled with cities, towns, and villages, whose inhabitants keep up a constant intercourse with each other, and profess nearly the same religion. The other three parts are inhabited by a number of different people, who have no connexion with and little knowledge of each other; and who differ much in their customs, manner of life, and in their religion.

Asia is inferior in size only to America. Its supposed extent, from the straits of Gallipoli in the west to the eastern shore of Tartary, is 4,800 miles; and its breadth, from the southern extremity of Malacca to the Frozen Ocean, is nearly 4,500. As the countries which are found in the interior part of this continent enjoy not the cooling air of the sea, as they are not watered by many rivers, as they have vast plains and barren mountains, the heats and colds are excessive, the land is not very fertile, and consequently not well cultivated. Even at the present time, those inland countries are only inhabited by people who in the morning pull down their cities and villages, carry them some miles with them, and build them up again at night in less than an hour.

It seems as if nature had rendered this unsettled and wandering life necessary, and intended that the establishments, laws, and government of this people should have less consistence, and be more subject to change, than those of others. The other inhabitants of Asia have often suffered much from the restless and unquiet character of this vagabond people. The northern part, which is full of lakes, marshes, and forests, has never been regularly inhabited; but the southern, eastern, and western parts are the most beautiful countries in the world; especially those which are situated towards the

south. These are extraordinarily fertile, and produce in abundance everything necessary for the support and comfort of life.

America is the largest division of the known world ; it is bounded, as far as yet has been discovered, on all sides by the ocean ; and extends from the 80th degree of north latitude to the 56th south ; and from the 35th to the 136th west longitude from Greenwich. It is nearly 10,000 miles in length, from N. to S. Its average breadth, from E. to W., is between 1400 and 1500 miles ; but at its broadest part it measures 3,690 miles. It is said to contain upwards of 14,000,000 square miles. America was discovered by Christopher Columbus, in 1491 ; but it got its name from Americ Vespuce, a Florentine, who discovered the continent south of the line in 1497. It is divided into two continents, separated by the isthmus of Darien, which, in the narrowest part, is scarcely sixty miles across. The cold which prevails in the northern part, the few useful productions that are found in it, its distance from other inhabited countries, are the causes why it is so little known ; but we have room to believe that the natural inhabitants of the country are not civilized. Forests and marshes still cover the land ; and hitherto the Europeans have only cultivated the eastern parts. In South America there were formerly great empires ; the remainder was inhabited by savages. Serpents, reptiles, and insects are much larger here than in Europe. In general, we may say that America is the most extensive and the worst inhabited part of the world.

Africa extends nearly from 37° south latitude to 37° north, and is about 4,300 miles in length ; and its greatest breadth, from Cape Verde to Cape Guardafui, is 3,500. Its form has been compared to a pyramid, the Cape of Good Hope being supposed the summit, and the northern coast along the Mediterranean its base. As it is under the torrid zone, there are immense sandy deserts, mountains of a prodigious height, forests almost burned up, and monsters of every kind. The excessive heat enervates and enfeebles the faculties of the soul, and very few well-governed states are to be found in it. Though Africa is the most contiguous part of the world

to Europe, yet the interior of it is, as yet, but little known.

If we calculate the number of leagues which these four parts of the world occupy, their size will appear very considerable ; yet all the countries actually known do not make one fourth of the globe ! And what is our earth in comparison of those immense bodies which God has placed in the firmament ! It is lost in that innumerable multitude of the celestial spheres, as a grain of sand is lost in a mountain. But to us, in whose eyes a cubit is a considerable length, the terrestrial globe is always a vast theatre of the wonders of God. And as we know but little of the worlds which are above us, let us endeavour to know that well which we inhabit, and use that knowledge to the glory of our Creator.

## AUGUST XXV

### THE NATURE AND PROPERTIES OF LIGHT.

EVERY moment we feel the utility of that light which is diffused over our globe, but we cannot, with certainty, determine what its nature is. All that the greatest philosophers have said on the subject is but conjecture. Is it enough to say, that light is a fluid which encompasses the earth, and requires only to be agitated by the sun, or some other inflamed body, in order to render it perceptible ? Or is it fire itself, which, by the emanation of its infinitely fine particles, gently strikes our eyes at a certain distance ? The first hypothesis has been adopted by the most eminent philosophers. It is certain, at least, that there is a great difference between fire and light. The latter is incomparably more subtile than the former. It penetrates glass and other transparent bodies in a moment, whereas fire does it very slowly. The pores of glass are consequently large enough to give a free passage to the light, while the fire meets with more resistance, because it is less subtile. Fire moves more slowly than light. Let burning coals be brought into a room, the heat diffuses itself very slowly, and the air becomes warm by degrees ; but the moment a candle is



brought into an apartment, the whole is suddenly illuminated, and wherever the rays can reach, the parts become visible. From these facts, and some others, it is concluded, that fire and light are different substances; although we generally see them both together, and find that one may produce the other. But the consequence drawn from this is possibly false.

The properties and effects of light are not less incomprehensible than its nature. The rapidity of its motion is prodigious. If its velocity were no greater than that of sound, it would take up seventeen years to come from the sun to the earth. But from very accurate observations of some eminent philosophers, it appears that light passes from the sun to us in eight minutes and twelve seconds. In the short space of one second, a particle of light traverses an extent of one hundred and seventy thousand miles! Now as sound is propagated only at the rate of 1142 feet in a second, a particle of light must be 786,000 times more subtile than a particle of air; although the latter cannot be perceived by the naked eye, nor by the assistance of glasses with the greatest magnifying powers. Further, the observations of astronomers inform us, that the rays of a fixed star, in order to reach us, must traverse a space which a cannon-ball, shot with the greatest force, could not pass over in less than 104,000 millions of years! The expansion or extent of the propagation of light is not less inconceivable. The space in which it is diffused is not less than the universe itself, the immensity of which exceeds the limits of the human understanding. It is by this almost unlimited diffusion of light, that the very remotest of the heavenly bodies in the solar system becomes discernible, either by the naked eye or by telescopes. And had we instruments that could carry our sight as far as the light is extended, we could not discover those bodies which are placed at the very extremity of the universe.

It is certain that our understanding is too limited to comprehend all the designs of God, relative to the nature and properties of light. But it is not less true, that we might explain many things, did we consider them with sufficient attention. Why, for instance, does the light propagate itself with such an inconceivable velocity,

but that an endless multitude of objects may be perceived at the same time by an infinity of persons? If, then, the rays of light move so swiftly, is it not that we may instantly discover the most distant objects? Were the propagation of the rays of light slower, great inconveniences would result to the inhabitants of the earth. The strength and splendour of the light would be greatly weakened; the rays would be less penetrating, and the darkness would be very slowly dissipated. Why are the particles of light so infinitely subtle, but that they may paint even the minutest objects in the eye? Why have not these particles more density, but that they may not dazzle us by their splendour, or injure us by their heat? Why are the rays refracted in so many ways, but that we may the better distinguish the objects which present themselves to the eyes?

Thus the Creator ever keeps in view the gratification and benefit of his creatures. What gratitude do we owe to this Father of lights for arrangements so wise and beneficent! Had he not created the light, how could we have enjoyed life? Of how many sources of pleasure should we have been deprived! And within what narrow limits would our occupations and knowledge have been confined!

## AUGUST XXVI.

### THE FORMATION OF BIRDS.

BIRDS are undoubtedly to be ranked among the most beautiful creatures on the earth. The form of their bodies, even in their smallest parts, is so regular and perfect as sufficiently to prove the wisdom of the Creator. Like the mammalia, or animals which give milk, they have real bones; but they are differently clothed. The bodies are covered with feathers fastened in the skin, laid one over another in a regular order, and furnished with a soft and warm down. The large feathers are covered above and below with smaller ones. Each feather consists of a quill and beards. The quill is hollow below, and by it the feather receives its nourish-

ment: towards the top it is full of a sort of marrow. The beards are a range of little thin flat flakes, closely connected at the two edges. Instead of having fore legs like a quadruped, birds have two wings; these are composed of eleven bones, in the muscles of which the feathers intended for flight are set. These feathers, turned back, form a species of vault, fortified by two rows of smaller feathers, which cover the root of the larger ones. The mechanism of the wings is truly admirable. They do not strike behind, like the fins of fish, but they act perpendicularly against the air which is under them, which greatly assists the flight of birds.

The wings are hollowed a little that they may take in more air, and the feathers are so closely united that the air cannot pass through them. The body is suspended between the two wings in a perfect equilibrium, and in the most convenient manner for them to execute their different motions. The heads of birds are made small, that the weight may not retard the vibrations of the wings, and to be more proper to divide the air, and make their way through that element. The principal use of the tail is not to supply the place of a rudder, but to preserve the balance in flying, and to assist the bird to ascend or descend in the air. The legs, never more than two, are so placed, as to preserve the body in the centre of gravity. In some birds, they are placed so much behind, that they can only be used in swimming. The limbs are composed of the thigh, the legs properly so called, and the claws. The thighs are covered with muscles, and generally with feathers. As to the legs, they are lean, and ordinarily naked. Most birds have four toes, three of which are before, and one behind. At the end of the toes they have nails, which they use either to assist them to perch, seize their prey, or take up their food. Some birds feed on animals, and others live on plants, particularly their fruits and seeds. Those which live on seeds steep and soften them in their crop, whence there can pass but a small portion of food at a time into the stomach, because in this sort of bird it is very small. Their stomach is composed of very strong muscles, by means of which the food is the better broken and ground; and ordinarily such birds swallow sand and

little rough pebbles, to assist digestion. Birds of prey have a weaker stomach, and they have recourse to small stones to assist its operations.

Not to see evidences of the wisdom and providence of God, in the formation of birds, would argue a total want of reason. The bodies of birds are formed throughout with so much art and harmony, that they are perfectly conformed to their manner of life, and to their different necessities. The stork and the heron, who must seek their food principally in marshes, have very long bills and long legs, that they may run in the water without being wet, and reach far in to seize their prey. The hawk and eagle, which live on rapine, are provided with large wings, strong claws, and large beaks, which are necessary to preserve them from starving. The swallow's bill is small and pointed; their mouth is large, and cloven up to the eyes; on the one hand, that they may not miss the insects which they meet with in flying, and on the other, that they may pierce through them more easily. The swan has a particular reservoir in its windpipe, whence it draws in air enough to breathe, while seeking its food, with its head and neck plunged under water. Several little birds, which fly and hop among the thickets, have a little membrane over their eyes, to defend them from injury. In a word, the formation of each bird is admirably appropriated to its manner of life, and to its wants. Each species is perfect in its kind; and none of their members is superfluous, deformed, or useless.

The wisdom observable here will appear still more admirable, when we consider that all the parts of birds are not only appropriated to their different necessities, but they also concur to give them the most beautiful shape. What an astonishing diversity of construction, proportion, and colour do we behold, from the raven to the swallow, from the partridge to the vulture, from the wren to the ostrich, from the owl to the peacock, and from the crow to the nightingale! All these birds are beautiful and regular in their kind, but each has its own peculiar beauty.

Thus a sight of the birds may become useful and edifying to us, if we accustom ourselves to contemplate

the Creator in them. Happy would it be for us if we made this use of the creatures; what a pleasing employment, what pure and heavenly pleasures, might such contemplations afford us!

## AUGUST XXVII.

### REFLECTIONS ON THE SKY.

WE have only to cast our eyes on the sky, to be struck with admiration at this magnificent work of the Creator. With what splendour does this sapphire vault shine, this rich canopy spread over our dwelling, especially during the night, when thousands of lustres are suspended from it, and the moon diffuses her mild light far and wide! Who can lift up his eyes and contemplate this ravishing sight without astonishment, without the sweetest emotion! But we discover still many more wonders when the eye of the mind traverses this immense space, and makes it the subject of its meditations. Where are the bounds of this space? Where its beginning, where its end? Innumerable spheres of a prodigious size are raised one beyond the other, and the human mind that would attempt to follow them in their rapid career must soon feel its own weakness. A pure ethereal air, infinitely subtile, is supposed to fill the whole space, and to support these prodigious masses, and mark out the orbits in which they continually revolve. There are neither props nor pillars to support this immense arch, and the enormous load which it carries; it is neither suspended nor attached to anything; nevertheless, it has supported itself thousands of years, and will continue to do so for ever.

How great is the number, how vast the bulk of those celestial bodies with which the ether is filled! The magnitude of the sun, and that of several planets which move round it, is vastly superior to that of our earth. And who knows but among the stars there may be found many equal, if not superior in size, to the sun himself! Their prodigious distance causes them to appear as brilliant points in the sky, but in reality they are so many

suns, whose immense circumference cannot be measured. The eye, unassisted with glasses, discovers an innumerable multitude of celestial bodies, when, during the night, they are permitted to sparkle in the absence of the sun. But how many more do we discover by the help of a telescope ! And is it not probable that there are multitudes of others which we cannot discover, because they are out of the reach of our best instruments ? We may venture to assert that thousands of suns and worlds roll in the ether ; and that the whole of the solar system is but the smallest part of that great host which is ranged above us in such beautiful order.

All this should fill us with admiration ; but the sky presents to an attentive mind greater wonders still. These bodies are in a continual motion, which is subject to invariable laws. They all turn round their own axes, and the greater part revolve in immense circles round other globes. A particular path is assigned to each, from which it never departs. They run their career with a rapidity that surpasses human imagination. They have a power by which they fly from the centre, and nevertheless an equal force retains them in their orbits. Though so many thousands of bodies roll in this place, yet they never strike against nor incommode each other. The stars which appear to us dispersed with so much confusion in the firmament, are, on the contrary, placed there in the best order, and in the most perfect harmony. For thousands of years they have risen and set regularly in the same manner ; and astronomers can foretell with the utmost certainty their position and their course. What new subjects of admiration should we have, had we a more extensive knowledge of these innumerable globes ! But we know little besides the system to which our earth belongs, and of which the sun is, so to speak, the monarch.

Who can lift up his eyes and contemplate the heavens without being struck with astonishment at the idea of that Supreme Being who has formed this magnificent work ! Let this admiration lead us to humble ourselves in the dust before him, and to adore and glorify his name. And while we acknowledge how weak and imperfect our homage is, let us look forward to that glorious change

which shall one day take place in us, when a nearer contemplation of those wonders which we now see obscurely and at a distance, will make our hearts overflow with gratitude and joy !

## AUGUST XXVIII.

### MORAL REFLECTIONS ON A CORN-FIELD.

THIS field was lately exposed to great dangers. Impetuous winds whistled round it, and the storm often threatened to beat down and destroy all the ears. Nevertheless, Providence has preserved it to the present day. Thus the tempests of affliction often threaten to overwhelm us ; yet these storms are necessary, they often become means of our purification, and of rooting up the tares of sin. Often, in the midst of trouble and sorrow, our knowledge, faith, and humility are increased and strengthened. It is true that, like the weaker stalks of corn, we often bend, and are bowed down to the earth ; but the compassionate hand of our Father supports and raises us up again.

As the harvest approaches, the corn ripens very fast. The dew, the heat of the sun, and the showers unite to bring it to its maturity. May we daily ripen for heaven ! And may all the events of our lives lead to this salutary end ! Whatever our situation may be here below ; whether the sun of prosperity shine upon us, or our sky be clouded with adversity ; whether our days be gloomy or serene, may all concur to perfect our piety, and fit us more and more for eternity !

It is worthy of observation, that those stalks which carry the largest and finest ears, differ much in height from those that are poor and light. The latter stand erect, and overlook the whole field, while the others bend under their own weight. These are emblems of two sorts of professing Christians. We see some who are vain and presumptuous, who, having but a small share of religion themselves, act insolently towards others, and regard the truly pious with contempt. A foolish presumption blinds them, and causes them to disdain the

proper means of salvation. Those, on the contrary, who are rich in grace, and abundant in good works, bend modestly down, like the well-filled ears.

All the corn which is to be cut down is not equal in goodness. How many tares and weeds are mixed with the corn! Such is the state of many Christians in this world; for a long time we observe in them a mixture of good and bad qualities; and their natural corruption, like tares, often hinders their progress in righteousness. A field of corn is not only the emblem of a Christian in particular, but also of the church in general. The profane and the wicked often sow, by their evil example, tares in the field where there should be nothing but good seed. The great Proprietor of the field permits those tares to remain for a season; he exercises patience and long-suffering, and will not give free course to his justice till the time of harvest, the great day of retribution. Behold with what eagerness the country people run to collect the fruits of the earth! The sickle levels all before them. Thus death brings all to the dust, the great and the small, the rich and the poor, saints and sinners!

But what does this noise in the fields mean? Oh, it is the sound of joy and gladness, at the sight of an abundant crop. Oh that they were also the cries of praise and thanksgiving, to celebrate the goodness of God, from which all these blessings proceed! But how joyful shall the righteous be in the great day of the harvest! With what unutterable love shall their hearts overflow when they are introduced into the blessed society of angels, and the spirits of just men made perfect! Then shall they remember with gratitude their former labours and sufferings, the dangers and tempests through which they have been safely brought, and their hearts and voices shall be united to magnify that beneficent Father who has watched over them. Let this pleasing hope support us in the time of trouble, let it comfort us in our sufferings, and cause us patiently to wait for the great harvest-day!



## ON METALS.

METALS form an important class of bodies, well deserving attentive consideration, and affording much cause of gratitude to God, who has placed them within our reach, and given in greatest abundance those which are most useful. Till modern times, only seven metals were known, two of which, gold and silver, were called perfect metals; the others, copper, tin, iron, lead, and quicksilver, were accounted imperfect metals. The researches of chemists presented many other bodies. Having metallic characters, they received the name of semi-metals. These distinctions are insignificant, and have fallen into disuse. Metals are distinguished as a class of bodies by a high degree of lustre, opacity, combustibility, and by affording a ready passage for the electric fluid. Their utility is exceedingly interesting. In all revolutions of science, these bodies have afforded facts of the greatest importance. They may be considered as the great instruments of human industry. Many of the mechanical arts could not exist without them; and it is probable that mankind would never have acquired without them that degree of civilization which characterizes the present state of society. They have not been decomposed by the chemist, and are therefore called elements. They unite with oxygen with different degrees of facility, on which account they hold some relation to inflammable solids.

This union of oxygen with the most inflammable metals produces alkalies and alkaline earths; others yield oxides, as the rust of iron, red lead, &c., bodies resembling earths; some few of them, combined with oxygen, furnish acids. They differ greatly in degrees of hardness, ductility, tenacity, fusibility, and other properties. The common metals, known from remote antiquity, are the most useful in the arts, and none more so than iron. Most of the comforts, and many of the luxuries and refinements of social life, are connected with their application.

The metals are found in the bowels of the earth,

sometimes on its surface. They seldom occur in a pure state, but in combination with various substances, as sulphur, oxygen, and acids of several kinds, and often are combined with each other. The minerals which contain them in considerable quantity are called ores, generally occurring in mountainous districts, making part of the mountains, or filling the cavities or openings of the rocks, called veins.

Gold was long considered as the heaviest substance within our reach ; but platina, a metal of white colour, between that of silver and tin, is much heavier. It was first brought from South America. Excepting this, gold still ranks as the heaviest body known.

Platina, gold, and silver do not readily unite with oxygen, and therefore are not easily tarnished by exposure to the atmosphere, which renders them proper for jewellery and various ornamental works.

But no metal is so useful, or found in so great abundance, as iron. It is very plentifully diffused in the bowels of the earth in most regions. In the northern parts of the world whole mountains are formed of iron ore. This metal pervades almost everything ; it is the chief cause of colour in earths and stones, and is found in plants and animals ; it is said that dry oak wood contains one-twelfth of its weight of this metal. When pure it is soft and ductile, and when rubbed emits a peculiar smell. In solution, its taste is sweet and styptic, and it is fused with difficulty. It is employed in the state of cast iron, not purified from carbon and oxygen, and some other substances. Wrought iron is deprived of these by heat and hammering. This again is converted into steel by various processes, which communicate to it a portion of carbon.

The knowledge, treatment, and modification of iron, in its different states, have great influence on the power and happiness of nations : it would require volumes to describe, in detail, its uses. It unites force and resistance to flexibility and spring. It serves for the purpose of constructing innumerable machines and utensils in its different forms of cast iron, malleable iron, and steel. By means of it the earth has been cultivated and subdued. Without iron, houses, cities, and ships could not

be properly built. It is subservient both to the common and refined arts. In its non-metallic state it is capable of yielding the most beautiful colours, as the Prussian blue, black dyes, &c. As a medicine, its uses are numerous and important. Its power of acquiring and retaining magnetism is not less useful than it is wonderful. To this astonishing property we owe the invention of the mariner's compass, an instrument by which our seamen traverse the ocean, and open a commercial, friendly, and beneficial intercourse with every quarter of the world.

The other metals have many useful properties, and are variously employed in the arts, in medicine, and in the common purposes of life, combining advantage, ornament, and elegance.

Shall we remain silent when we contemplate this order of things? Or shall we not rather express the feelings of gratitude, and say, "O Lord, all thy works praise thee, and all of them declare thy unbounded goodness to the sons of men!"

## AUGUST XXIX.

### SHELL-FISH.

SHELL-FISH, or testaceous animals, constitute a very considerable part of the animal kingdom. They live in houses of a substance more or less calcareous, which may be considered as their bones. Their shells are either univalve, i. e., of one piece; or bivalve or multivalve, i. e., composed of two or more pieces. Testaceous animals form two large families, the muscle, the shell of which consists of more than one piece, and the sea-snail, whose shell is in one piece, and generally spiral. The construction of the former is much more simple than that of the latter. Muscles have neither head, horns, nor jaws. A windpipe, a mouth, and sometimes a species of foot, are all that can be distinguished in them. The greater part of the snail kind have, on the contrary, a head, horns, eyes, and a foot.

There is a great variety among shell-fish relative to

generation. In some the sex is discoverable, others are hermaphrodites, and some seem to be of no sex. Some are oviparous, others are viviparous. Testaceous animals are born with their shells on them; but in proportion as the animal grows in his house (the interior walls of which are covered with a very fine membrane) it increases also, not only in thickness, by layers one over the other, but also in circumference, because the circumvolutions or spires multiply more and more. The shells are formed by a viscous liquid, which transpires from the animal, and which grows hard, and thickens by degrees. But whether shells grow by an external juxta-position, or by inward nourishment in the ordinary way, has not been absolutely determined. However, it is most likely that they are formed in the way first mentioned. Most shell-fish live in the water, and especially in the sea; sometimes near the shore, and sometimes in the main ocean. Some are carnivorous; others feed on plants. Some stay at the bottom of the sea; others stick immovably to the rocks. Oysters, and many other animals with hard shells, attach themselves to different substances, and continue firmly united to them, by means of a glutinous, gritty liquor; and often they are cemented one to another in heaps. This adhesion is voluntary in some shell-fish, which fasten themselves as occasion may require; but it is involuntary in others, which continue always immovable on those rocks to which they fasten at first.

The knowledge we have of various animals is still very imperfect. As they mostly live in the bottom of the water, it is very difficult to make exact observations on their formation, mode of life, food, propagation, motions, &c. As yet we know but three or four classes of shell-fish; but it is very likely that hundreds of others might be discovered, could we carry our researches to the depths of the sea, and the bottom of rivers. Hitherto we have scarcely attended to any thing besides the beautiful shape and colour of shells; but the true construction and manner of life of the animals which inhabit them are still very little known; and we know almost nothing of the end for which they were formed. Nevertheless, this class of animals furnishes us with subjects sufficient

to lead us to admire the infinite grandeur of God. How immense is his empire ! In every place we find creatures, each of which, in its particular order, bears the signature of the Divine Majesty. To be convinced of this, we have only to enter into the cabinets of those who preserve the shells of these animals. Let us consider the prodigious diversity manifest in their size, form, and colours. Here the finger of God is visibly shown, and every thing convinces us that he has proposed ends highly worthy of his wisdom and goodness.

### AUGUST XXX.

#### ON THE GOVERNMENT OF GOD.

A God who, from his supreme elevation, could be an indifferent and idle spectator of all the revolutions which take place in the world, would not be worthy of our homage. Happy for us, that the government of the God we adore comprehends all his creatures. Everywhere we may find the centre of his empire, but we nowhere find its limits. All his works are continually before his eyes. He sees the past, the present, and the future, at one glance, and comprehends all their relations and dependencies. The least events, the most trifling circumstances, so far from escaping his notice, enter all into the plan which he has formed to accomplish the infinitely wise and holy ends which he has proposed ; and all these ends unite and concentrate to produce the greatest possible degree of happiness to his creatures. Yes, God takes pleasure in his works : with one glance of his eye he sees the whole ; and with a single act of his will he governs all. His laws are dictated by infinite wisdom, and his commandments are a source of joy and happiness.

God, by his providence, preserves the different species of creatures which he formed in the beginning of the world. Animals die, but others come in their place. Generations of men pass away, and others succeed them. The Ruler of the world makes use of inanimate creatures to preserve and render those that live happy ; and finally,

he subjects the whole to man, who, of all his creatures here below, is alone capable of knowing his works and adoring him.

This God, who is holiness itself, wills that all his creatures should be holy. By the continual proofs which he gives them of his love for goodness, and his hatred to evil, he speaks to their hearts, and necessarily encourages them to walk in the way he has pointed out. He directs their actions to this end: he renders their designs abortive when they are contrary to his merciful views; and he furnishes them with means to avoid the paths of iniquity. What wise measures did he make use of to lead the children of Israel to the blessed ends he proposed! In vain did the idolatrous nations more than once conspire to destroy them; they were still supported by the protection of their God. He neglected nothing to maintain his pure and holy religion among them; which distinguished them from the idolatrous people around.

But our God dwells in light inaccessible. There are depths of wisdom in his government, which no creature can fathom. Our understanding is too weak to comprehend the whole of the plans of the Lord, so as to form just ideas before the event has unfolded them. Our knowledge is too limited to penetrate the infinitely wise counsels of the Divine Being, and to discover, beforehand, the motives of his conduct and of his dispensations. The wicked often sit among princes, while the righteous pine in the dust: the wicked triumph, and the good man is oppressed. Everything smiles on the bad, while the friend of God meets with nothing but affliction and loss. And yet there is a Providence. Yes, notwithstanding all these apparent disorders, the Lord is ever the tender Father of his creatures; their God, infinitely wise; and their just and equitable King. He should be adored in all his dispensations, however impenetrable they may appear to us. His counsels are marvellous: his plans surpass our understanding; all that takes place in this world, and which so often astonishes us, tends to the accomplishment of the most excellent designs. That load of affliction and misery under which we groan may possibly have the happiest influence over our future state; this apparent evil is probably

an indispensable remedy for the soul ; and on this salutary chastisement the perfection of our faith, the purification of our heart, and our eternal felicity, may in a certain measure depend. O thou who art discontented with thy lot, consider these things, and thou shalt cease to complain. "Why, O man, dost thou undertake to fathom those purposes according to which God governs the world ? Thy understanding is limited, and yet thou pretendest to discover the views which an infinite Being proposes to himself ! Thou canst not comprehend the connexion of those things which pass under thy notice ; thou art ignorant of that which went before, and of that which must follow ; and nevertheless thou hast the presumption to decide concerning causes and effects ! Providence is just in all its plans, and in all its dispensations. It is true that thou canst not always see the motives of his conduct : to be able to comprehend them, thou must be what God is."

## AUGUST XXXI.

### A HARVEST HYMN

OUR fields, crowned with ears of corn, are a hymn of praise to Jehovah : the joy which sparkles in the eyes of the reaper is a hymn to the God of nature. It is he who causes bread to spring out of the earth, and who loads us with his blessings. Come, let us assemble, and sing unto the Lord ; let his praise be for ever the subject of our songs. Let us listen to the voice which we hear from the bosom of our fruitful fields. "The year shall crown thee with its blessings. O world, thy happiness is my work. I have called forth the spring ; the harvest and its produce are the works of my power. The fields by which thou art supported, and the little hills covered with corn, are mine." Yes, O Lord, we see thy Majesty, and feel the value of thy favours. It is by thee that we exist ; life and its supply are presents from thy hand. Blessed be thou, O field, which producest food for man ! Flourish, thou beautiful meadow ; clothe yourselves with thick foliage, O ye forests ! God of na-

ture, be thou ever beneficent towards us! Then, from the dawn of the morning to the close of the day, the Lord shall be the object of our praise. Free from anxiety, we shall rejoice in his benefits, and our children shall repeat after us: "The God of heaven is our Father; the Lord, the Lord, he is God!"

THANKSGIVING FOR GOD'S PROVIDENTIAL CARE OF HIS  
CREATURES.

LORD, thou art worthy to receive glory, honour, and praise. Lord, my God, my Redeemer, my Rock and my High Defence. My soul blesses thee. I will publish thy wonders: I will rejoice and be glad in thee, and celebrate thy name, O thou most High.

I give thee thanks for that immortal soul which thou hast given me, which thou hast redeemed by the blood of thy Son, and which thou sanctifiest by thy grace.

I praise thee for the body thou hast given me, and which thou still preservest in health and strength; for these limbs, so well adapted to their ends; and for my senses, which are still preserved in strength and vigour. Eternal Source of life and happiness! to thee I owe my being, and for it I praise thy name!

I give thee thanks for that fatherly goodness with which thou providest daily for my support; and for those various and innumerable blessings which thou dispensest to me, and which render my life comfortable.

I praise thee for those tender connexions thy providence has led me to form; and for the inestimable present thou hast made me in giving me friends.

I give thee thanks for the glorious hope I have of knowing one day, by happy and eternal experience, in what the blessedness of heaven consists.

I praise thee for this month, which I am now so happily concluding. O God, thou hast done great things in my behalf; my soul rejoices in it; may I magnify thee for ever and ever! Amen.



## SEPTEMBER I.

## A HYMN TO THE PRAISE OF THE MOST HIGH.

SING unto the Lord with holy rapture ; sing a new song unto our God ! The Lord is great ! Let us for ever celebrate this Being, who is infinitely good, infinitely wise, and from whose eyes nothing can be hid.

He has stretched out this starry heaven as a pavilion over our heads. There, encompassed with the splendour of innumerable suns, he has established his throne. There he dwells in light inaccessible to mortals.

O Lord, I am lost in this splendour ; but thou, in thy infinite goodness, art to be found everywhere : thou art incessantly present with all thy creatures. Astonished at the wisdom of thy providence, and penetrated with admiration, I praise and exalt thy holy name.

I glorify thee, who governest the earth with paternal care. Thou enlightenest it by the sun ; thou waterest it by showers ; and refreshest it by dews.

Thou coverest it with smiling verdure ; thou crownest it with flowers ; thou enrichest it with crops ; and renewest its ornaments and its blessings year by year.

Thy care extends to all that exists ; and the smallest creature is an object of thy kind attention. The young raven, which, covered with snow, cries unto thee from the summit of the barren rock, is fed by thy hand.

Thou commandest the cooling stream to run from the bosom of the barren mountains ; thou orderest the sun to invigorate the vines which adorn the hills, and ripen the fruits of our orchards ; thou sendest the cooling breeze into our forests.

When thy sun begins to illuminate the world by the splendour of his fires, he calls forth the creatures to their labour : all is active in nature, till the time when the silence and darkness of the night bring on the desired repose.

But, as soon as the day begins again to spring up, the choir of birds cause the air to resound with songs of gratitude and joy : it is then that all the nations of the

world, and all the zones under heaven, lift up one concert of praise unto thee.

To thee they sing, Father of all beings! Thou lovest all, thou loadest all with thy blessings; thou hast designed all men for happiness, provided they themselves desire to be happy.

May thy name be celebrated in all the worlds which compose thy empire! Let every voice unite in a universal song to that God whose goodness is unlimited, and whose wisdom is eternal!

#### THE OMNIPRESENCE OF GOD.

THOU art present everywhere, O Almighty God! Yes, thou art here, thou art afar off, thou fillest the universe. Here grows a flower; there shines a sun: thou art there, thou art here also. Thou art in the breeze, and in the tempest; in the light, and in the darkness; in an atom, and in a world. Thou art present here in this flowery valley; thou attendest to my feeble accents, and thou hearest at the foot of thy throne the sublime songs which accompany the seraph's lyre. O thou, who art the God of the seraphim, thou art also my God! Thou hearest us both; thou hearest also the joyous notes with which yonder lark causes the air to resound; thou hearest also the humming of that young bee that flutters round the rose. Omnipresent Being! if thou hearest me, grant also my request: may I never forget that I am in thy sight; may I think and act as in thy presence; that when cited to the tribunal of my Judge, with the whole world of spirits, I may not be constrained to flee from the face of the Holy of Holies!

#### SEPTEMBER II.

##### THE BEAUTY AND VARIETY OF BUTTERFLIES.

LET us examine those beautiful creatures before they die; probably this examination may be instructive both to our understanding and to our heart.

The first thing that merits our attention, when viewing these inhabitants of the air, is the dress with which they are adorned. Some of them, however, have nothing particularly striking in this respect; their clothing is plain and simple. Others have a few ornaments on their wings; and some have such a profusion that they are entirely covered with them. Let us reflect for a few moments on this last species. How beautiful are the shades which adorn it! How pretty the spots which set off other parts of its dress! With what delicacy has nature pencilled them! But, however great my admiration may be, while I view this insect with the naked eye, it will be vastly increased when I view it through a microscope.

Who could have imagined that the wings of butterflies were garnished with feathers? And yet nothing is more certain. What is commonly termed dust on their wings is found to be feathers. Their structure and arrangement are as full of symmetry as their colours are of beauty. The central parts of these little feathers, which come in contact with the wings, are the strongest; those, on the contrary, which form the external circumference, are much more delicate, and extremely fine. All these feathers have a quill at the end; but the superior part is more transparent than the quill from which they proceed. If the wing be roughly handled, the more delicate part of the feathers will be destroyed. But, if what is called the dust be wiped away, nothing remains but a fine transparent skin, where may be readily distinguished the little holes in which the quill of each feather was inserted. This skin, from the manner of its formation, may be as easily distinguished from the rest of the wing, as fine gauze from the cloth on which it is sewed; it is more porous, more delicate, and seems as if embroidered with a needle; lastly, its contour is terminated with a fringe, the threads of which are extremely fine, and succeed each other in the most regular order.

What are our most elegant dresses in comparison of that which nature has given this insect? Our finest laces are but coarse cloth, compared to the delicate texture which covers the butterfly's wings; and our finest threads appear, in presence of this, but a clumsy rope. Such is the extreme difference between the works of

nature and art, when examined through a microscope. The former are finished in the utmost perfection imaginable ; the latter, even the most beautiful in their kind, have no proper finish, and are coarsely made up. How beautiful does a fine piece of cambric appear to us ! Nothing more delicate than its threads ; nothing more regular than its texture : nevertheless, these fine threads, viewed through a microscope, resemble hempen pack-thread ; and we should rather suppose the cloth to have been wrought by the hands of a basket-maker than by an excellent weaver.

What is most astonishing in this brilliant insect is, that it comes from a worm, whose appearance is mean and vile. See how this butterfly spreads its sparkling wings to the sun, how it sports in his rays. How it rejoices in its existence, and flutters from flower to flower. Its splendid wings present us with the magnificence of the rainbow ! How beautiful is it now ! How much has it changed since the time in which, under the form of a reptile, it grovelled in the dust, always in danger of being trodden to death. Who has raised it above the earth ? Who has given it the faculty of living in the air ? Who has given it these beautifully coloured wings ? It was God. It was its Author, and ours. In this insect he has shown us an emblem of the transformation which awaits the righteous ; a day will come when, quitting this present form, they shall cease to grovel on the earth ; then, holy and glorious, they shall be raised above the clouds ; and, having nothing to obstruct their activity, they shall spring forward even beyond the stars themselves.

### SEPTEMBER III.

#### THE GROWTH OF TREES.

EACH tree, however bushy it may be, receives its principal nourishment from its lower parts ; and it is probable there is in it a circulation of juices, similar to the circulation of blood in the human body. The extremities of the roots are a prodigious mass of spongy fibres, and globules of air, but are always open to imbibe

the juice which the earth affords them. This juice is at first nothing but water, impregnated with earthy particles; then, by means of a sort of milky substance, which is peculiar to each tree, and which distinguishes it from others, the juice acquires a nutritive quality before it ascends into those parts of the tree which are above the surface of the earth. By the assistance of a microscope, wood, notwithstanding its hardness, is found to be nothing else than an assemblage of an infinite multitude of little hollow fibres.

Most of them, particularly in shrubs, ascend perpendicularly; but, to give more consistence to these fibres, there are in certain trees, particularly in those designed to be strong and hard, tubes which proceed horizontally from the centre to the circumference. Attracted by the heat of the sun, the juice ascends by degrees into the branches, and to all their external parts; as the blood proceeding from the heart is carried by the arteries to the extremities of the animal body. When the juice has been sufficiently diffused through all the parts where it was necessary, what remains ascends by certain large vessels, placed between the outer and inner bark, just as the blood returns back through the veins. From this a growth results which is annually renewed, and this is what constitutes the size of the trees. To be convinced of this, we need only cut a branch transversely, and from this we shall be able to ascertain the age of the tree. While the trunk grows more and more in height, the root grows downward in the same proportion. As to the exterior bark, it appears to be designed to serve, in some sort, as a garment to the tree, to unite the component parts closely together; and to preserve the tender but essential parts, from external accidents, and from the intemperature of the air.

Thus has the wise Creator formed an admirable system of solid and fluid materials, in order to give life and growth to those trees which adorn our fields, and give shade to our flocks, our shepherds, and our cottages; and which, when cut down, serve so many useful purposes to many. In this we discover that wisdom which is never mistaken, which prescribes to nature laws, in certain respects, immutable; and which act uninterrupt-

edly under the eye of Providence. A wisdom so profound, an art so marvellous, so many preparations and combinations for each tree, should excite us to venerate and admire his creating hand. The contemplation of this wisdom is a most delightful study, and must animate us to glorify that God, so great in his counsels and plans, and so wonderful in their execution. The more traces we discover of this wise Providence, the more we should be induced to place all our interests in his hands, who can never want means to turn all things to the advantage of his creatures. Finally, we should be encouraged to raise our affections to him, and supplicate him to enrich our souls with the gift of wisdom, and cause them to grow in grace.

May we, in our progress through life, resemble a flourishing tree. May we incessantly grow up in all righteousness! May we bring forth fruit suitable to our situation in life, and to that capacity which God has given us! May we also grow inwardly! May our souls be strengthened in holiness; established against all the storms of life; and deeply rooted in humility! May we never find the emblem of our state in an old tree, which the longer it grows, the more it attaches itself to the earth. The nearer we come to the tomb, the more free should we be from all earthly attachments.

## SEPTEMBER IV

### THE ANT-LION.

No insect is more famous for its dexterity than the ant-lion; there are fifteen species of them, but the formicarius, or ant-eater, is the most remarkable; it nearly resembles the woodlouse. It is provided with six feet; and its body, which is composed of many membraneous rings, terminate in a point. Its head, flat and square, is armed with two moveable crooked horns, whose singular structure shows how admirable Nature is, even in her smallest works.

This insect is the most subtle and dangerous enemy the ant has; the plans he forms to ensnare his prey are

very ingenious. He mines a portion of earth in form of a funnel, and there waits in expectation of dragging to the bottom those ants which may chance to come to the precipice. In order to dig it, he traces in the earth a circular furrow, the circumference of which is exactly equal to the opening of the funnel; and the diameter of the funnel is always equal to the depth of his ditch. When he has fixed on the size of this opening, and traced the first furrow, he digs a second, concentric to the first, that he may throw out all the sand inclosed in the first circle. All these operations he performs with his head, which serves him in place of a shovel; and its flat and square form renders it fit for this purpose. He also takes some sand with one of his fore feet to throw it beyond the first furrow, and this work he repeats till he has got a certain depth in the sand. Sometimes in digging he meets with grains of sand, or dry bits of earth, too large to remain in his funnel. Of these he rids himself by a quick and well-timed motion of his head. If he finds larger substances he endeavours to push them away with his back; and he is so assiduous in his labour that he repeats it even six or seven times.

At last, the ant-lion comes to enjoy the fruit of his labour. When his nets are once well laid, he is on the watch; motionless, and concealed at the bottom of the ditch which he has digged, he waits for the prey that he is unable to pursue. Should any ant come on the brink of his precipice, it generally rolls down to the bottom, because the brink is made sloping; the loose sand gives way under his feet, and the insect falls into the power of its enemy, who, by the assistance of his horns, drags it under the sand, and feasts on it by sucking its blood. When nothing remains but the dead body, without blood or juices, he casts it out of his trench, and repairs any injury it may have sustained, and sets himself in ambush anew. He does not always succeed in seizing his prey the moment it falls in; it often escapes, and endeavours to climb up to the top of the funnel; but then the ant-lion works with his head, and throws a shower of sand on his prey, part of which being cast beyond the ant drags it down to the bottom of the trench.

All the actions of this little animal are so full of art

that we might long examine them without being wearied. The ant-lion employs himself in preparing his trench before he has even seen the animal which is his destined nourishment ; nevertheless, his actions are so well regulated that they become the most proper means of providing his subsistence. How could such a slow-paced animal as this catch his prey so well as by digging in loose sand, giving a slope to his trench, and in overwhelming with showers of sand the insect that happens to fall into it ? All these actions have their fixed principles by which they are directed. His trench must be dug in the sand, without which it would not be fit to entrap his prey ; he must, according to the structure of his body, work backwards, and use his horns like tongs, to cast the sand over the brink of his funnel. The instinct which directs this structure shows us a First Cause, whose unerring wisdom has foreseen and ordered everything necessary to the preservation and well-being of such an animal. The dexterity which he evidences is not the fruit of experience and exercise, it was born with him ; we must then seek its origin in the wisdom, power, and goodness of that Supreme Being, who has proportioned the instinct of animals to the different degrees of their wants.

These reflections are a new motive to induce us to glorify him who is the Creator of all. He is the source of life, and he wishes to diffuse it everywhere. He has formed this insect so as to make its existence a blessing to itself. He has furnished it with the necessary means for the preservation of life ; and by the instinct with which he has endued this animal, however limited in other respects, he has raised it to a degree of ingenuity approaching to reason, and in some respects even surpassing it. And what has been his design in all this, but only to furnish us with opportunities of knowing him, even by means of the most despicable creatures ? To this purpose we should devote this piece of natural history. Every insect, however insignificant it may be, should cause us to raise our minds to him who has created the small worm as well as the elephant, and who extends his care to the one as well as to the other.



## SEPTEMBER V

## CONFORMITY BETWEEN PLANTS AND ANIMALS.

It is more difficult than we imagine to find out the specific difference between plants and animals. It is by imperceptible degrees that nature descends from animate to inanimate beings; and exactly to distinguish these degrees, the penetration of an archangel would be requisite. But we may remark, that notwithstanding all the differences which we observe between those two species of organized bodies, there still remains much resemblance.

The seed is to the plant what the egg is to the animal. From the former springs the stalk, which was before concealed under its coats; and this stalk makes an effort to raise itself out of the earth. In like manner the animal inclosed in the egg breaks the shell in order to breathe the open air.

The eye or bud of the tree is the same in the vegetable that the embryo is in the animal kingdom. The eye does not pierce through the bark till it be of a proper size; and it continues attached to it, in order to derive nourishment from it, as well as from the fibres of the plant. The embryo, at the expiration of a determined time, comes from the womb, but could live but a short time were it not to receive nourishment from its mother.

The plant feeds on nutritive juices, which are brought to it from without, and which, passing through various canals, are at last changed into its substance. The nourishment of the animal is effected nearly in the same way. It also receives nourishment from without, and after having passed through different vessels, it is changed into animal substance.

The fecundation of the germ takes place in the vegetable kingdom, when the dust of the stamina penetrates into the pistils; in like manner fecundation takes place among animals when the seminal liquor penetrates into the ovaries or matrix.

The multiplication of plants is effected, not only by

seeds and ingrafting, but by slips. Animals multiply in like manner, not only by laying eggs and bringing forth their young alive, but also by slips, as in the case of the polypus.

The diseases of plants have either external or internal causes. It is the same with the diseases of animals.

Lastly, death is the common lot of the one as well as of the other. When old age has indurated and obstructed the vessels, the circulation of the juices is stopped.

Plants and animals dwell in the same places: the surface and interior parts of the earth; the air, the sea, and the rivers, are filled with plants and animals. Both are extremely numerous; though plants are not so numerous as animals.

The size of the greatest tree is nearly equal to that of the largest animal.

Thus one might be tempted to believe that animals and plants are beings of the same class, seeing nature passes from one to the other by imperceptible gradations. It is very certain that some general and essential resemblances have been found between these two kingdoms; but the truly essential differences have not as yet been pointed out. And though some should be discovered which have not as yet been observed, it will ever remain certain that nature has diversified her works by such fine shades, that the human mind can scarcely distinguish them. And who knows what discoveries may be reserved for our posterity? Probably plants may yet be found out whose properties shall still more nearly resemble those of animal bodies. And, perhaps, animals may be found out, which more nearly resemble vegetables than even the polype itself.

Let us make that use of the knowledge we have, for which all the truths of nature and revelation were designed. Let us use it to glorify God, and to strengthen ourselves in virtue. Let the great resemblance which is found between animals and plants render us sensible of the power and wisdom of that Being who has, in some sense, impressed the character of infinity on all his works. But, O man, learn to be humble. Thou also partakest of the nature of the plant, and of that of the

animal. To Jesus alone thou art indebted for the privilege of being placed between brutes and angels. Endeavour, by godliness, to resemble those celestial spirits more and more. And seeing it is granted thee to bear some resemblance to the Creator of all things, seek incessantly to be fitted for the kingdom of his glory. Think of what thou art, and think of what thou mayest be.

“How wonderful is that creature who, like the brute, derives his nourishment from the bosom of the earth, and, like the angel, raises his thoughts to heaven! A creature, one half of which perishes as the brute perishes, while the other half lives in immortal life! A creature, destined to holiness and perfection; to be free, and yet subject to God; to praise him for ever, and to be for ever happy!”

## SEPTEMBER VI.

### THE NATURE AND PROPERTIES OF SOUND.

ALL sounds are produced by means of the air; but in order to this, the air must be put in motion; not that the agitation of the air is the cause of sound, for in that case every wind would be attended with a noise. To produce sound, the air must be suddenly compressed, that it may afterwards dilate and expand itself by its own elastic force. By this a kind of tremulous or undulatory motion takes place, something like those waves and concentric circles which take place in the water when a stone is cast into it. But if this undulatory motion depended only on the particles of air which were compressed, the sound in many cases could never reach our ears. It is therefore necessary that the sonorous body, after having made its impression on the contiguous air, should continue the impression from particle to particle, in a circular direction, to all parts.

By means of this propagation the particles of air reach our ear, and we have then the perception of sound. This propagation takes place with prodigious velocity. Sound goes at the rate of 1142 feet in a second. This

calculation, which has been verified by a multitude of experiments, may be very useful in many cases. It contributes to our safety, by informing us how far the lightning is from us, and, consequently, whether we are secure in the place we see the flash. We need only count the seconds, or the strokes of our pulse, between the lightning and the clap, and we can immediately tell at what distance the thunder is. By the same means we may calculate the distance of places, and that which separates two vessels. But it is very remarkable, that a weak sound is propagated with as much celerity as one that is strong. The agitation of the air is, however, more strong when the sound is louder, because a greater mass of air is put in motion, and because the vibrations of the air, although performed in the same time, are propagated through a larger space, the velocity of the vibrating atoms being in the direct proportion of the spaces through which they oscillate: hence, when these spaces are greater, the particles of air move faster, and strike the tympanum of the ear with greater force. The sound is loud when many particles of air are put in motion, and the contrary when there are but few.

But of what use would these observations be, which philosophers have made on the nature and properties of sound, if our bodies were not so formed that we might have the perception of sound? Let us praise God, who has not only so disposed the air that sound may be propagated by means of its vibrations, but has also given us an organ by which we are capable of perceiving those sonorous impressions. A thin elastic membrane, stretched on the bottom of the ear, as the skin is on the drum, receives the vibrations of the air; and by this we have the power of distinguishing all sorts of sounds. Thus far our knowledge reaches. But if we ask how, when a word is pronounced, we receive the idea of that word, and not of a simple sound; or how a tone can act upon our mind, and produce in it so many different ideas; we are obliged on all these points to confess our ignorance. It is necessary that this and everything else should convince us of the wisdom and goodness of the Creator. Were there no sound, all men would be dumb, and we should be as ignorant as infants who have not

yet the use of speech. But by means of sound each creature may make known its wants, or express its happiness.

But man has great advantages over other animals. He can express the sentiments of his heart, and excite all the passions by certain tones of his voice. God has not only endued us with a power to distinguish sounds by the organ of hearing, but has furnished us with means to preserve this precious faculty. When one ear is injured, the other can supply its lack of service. And he whose hearing is weak may improve it by the acoustic horn. Even when the outer auditory pipe is injured, the internal one, which terminates in the mouth, may remain unhurt. Farther still; the Creator has even condescended to make this minister to our pleasures; a multitude of musical instruments may delight and charm us, and we are able to distinguish their different tones; for the auditory nerve transmits with the utmost fidelity the tones of an infinite number of sonorous bodies. With what sentiments of gratitude to our beneficent Creator should we be penetrated, when we consider what his kindness has done for us! May we never forget our obligations! May our thanksgiving reach as far as sound extends! May the universe re-echo his praises, and heaven and earth hear the great things which God has done for man!

## SEPTEMBER VII.

### MYSTERIES OF NATURE.

WHEN men attempt to investigate things, and to penetrate into the causes of those effects which they have seen, they are obliged to acknowledge how weak and limited their understandings are. The knowledge we have of nature, of which we are sometimes so vain, scarcely extends any farther than to a superficial acquaintance with the effects of a few things which we have constantly before our eyes, and which we are able, in a certain measure, to apply to our advantage. But as to knowing the causes of these effects, and how they

operate, is to us an impenetrable mystery. There are even a thousand effects in nature which are concealed from us; and those which we can in some measure explain have a certain obscurity, which obliges us to remember that we are but men. There are many phenomena, the immediate causes of which we know not. Several are doubtful; and there are very few that we know with certainty.

We hear the wind blow; we experience its great and various effects; but we do not exactly know what produces it, what increases it, and what abates its violence. From a small seed we see a plant spring with stalks and ears, and we know not how this is effected. As little can we comprehend how a plant can spring from a small kernel, which increases to a large tree, in the branches of which the fowls of the air may build their nests; which clothes itself with leaves and blossoms, to shade and please us, and brings forth fruit for our nourishment, and affords us wood for many necessary uses. All the aliments we use, which are so very different in their nature, are transformed within us by an incomprehensible mechanism, and assimilated to our blood and to our flesh. We see the wonderful effects of the loadstone, and we believe there must be a certain matter which operates in it; but whether it acts by an attracting force peculiar to itself, or whether the magnetic influence circulate about the stone, or whether it form a sort of vortex, we cannot determine.

We feel the cold; but no naturalist has been as yet able to discover how it is produced. We know more of thunder and lightning than our ancestors did; but what the nature of that electric matter is, which in thunderstorms is so terrible, no man knows. We know that the eye sees the images which are painted on the retina; that the ear has the perception of sound by the vibrations of the air; but what are perceptions, and how are they formed? We have a conviction of the existence of the soul in the body; but who can explain the union of the body and soul, and their mutual influence on each other? The effects of fire and air are continually before us; but who can tell what their nature is, what are their elementary parts, and how they produce their dif-

ferent effects? In a word, in respect to most things we have no fixed and incontestable principles, and are reduced to take refuge in probability and conjecture. What are all the hypotheses of philosophers but tacit confessions of their limited knowledge? At every step nature presents us with wonders which confound us; and notwithstanding all our discoveries, a thousand things remain which we cannot comprehend. It happens sometimes, it is true, that we can give happy explanations of certain phenomena; but the principles, the first springs, their nature and mode of operation, are certainly far exalted above the sphere of our understanding.

The mysteries of nature give us daily lessons of wisdom, on the subject of the mysteries of revelation. In nature, God has placed within our reach the means by which we may go through life comfortably, though he has placed their causes out of our sight. It is the same in the kingdom of grace; he affords us means to arrive at a spiritual and eternal life, although the manner in which they operate is concealed from us. Is there a person who would refuse to eat and drink, till he could comprehend how food increases strength, and preserves life? Is there a man to be found, who would neither sow nor plant till he could comprehend the nature of vegetation? Is there any who would refuse to make use of wool till he could tell how it is formed? Man does not push his extravagance so far. On the contrary, he observes the productions of nature; experience tells him their utility, and he enjoys them with gratitude to his Maker. But why do not men conduct themselves so in respect to the mysteries of grace? Men dispute about the nature of the means of salvation; their efficacy, and their mode of operation; and they neglect that saving use of them which God intended. Oh, why are we not as wise in things spiritual as in things temporal? Instead of giving way to vain and useless speculations, let us avail ourselves of those means of grace which God affords us, and make a faithful use of them! For this end they were granted us, and not for subjects of curious speculation concerning their nature and manner of operation. If we find things which we cannot fathom

or comprehend, let us receive them with humility, and acknowledge the weakness of our understanding. The advantage which we shall derive from a faithful use of them will be sufficient to convince us that they are the work of a Being infinitely wise and infinitely beneficent.

God forbid that we should be so presumptuous as to flatter ourselves with the hope of being able to fathom either the mysteries of the kingdom of nature, or those of the empire of grace ! Let us not dare to criticise or blame what we cannot comprehend. Let us rather acknowledge the weakness of our understanding, and the infinite greatness of God. Then each mystery will excite us to adore that infinite Being whose works are marvellous, and whose ways are past finding out !

## SEPTEMBER VIII.

### THE EYES OF ANIMALS.

THE bare consideration of the eyes of different kinds of animals is sufficient to convince any person of the wisdom with which God has formed the bodies of his creatures. He has not given the sense of sight to each in the same way, but has diversified the organs of it so as to adapt them in the best way to different kinds of animals. Deep reflection on this subject will afford us one of the noblest pleasures of which the human mind is capable.

The eyes of most animals appear round ; but in this spherical figure there is great variety. Their situation in the head, near the brain, the most sensible part of the system, is subject to many differences also. Man, and most quadrupeds, have six muscles attached to each eye, by which they can move it from side to side. The position of the eye is such, that they see straight before them, and describe nearly a semicircle. But even in this there is a diversity. Horses, oxen, sheep, swine, and most quadrupeds, have a seventh muscle, to suspend and support the eyeball, which is highly necessary for



them, because their head and eyes hang towards the earth while seeking their food.

The eyes of frogs differ from ours, as they can cover theirs with a membrane, which is transparent, though of a sufficiently close texture. This defends their eyes, and guards them from those dangers to which animals in their way of life are exposed, by living sometimes on the land, and sometimes under water. Flies, gnats, and similar insects, have more perfect sight than other creatures. They have nearly as many eyes as they have apertures in their cornea. Whereas other animals, which have but two eyes, are obliged to turn them by means of muscles towards the objects, flies can see them distinctly on all sides without interruption, and without the trouble of turning their eyes; because one or other of these little eyes is, from its nature, always directed towards some one of the objects which surround them. Fish, which live in a denser element than ours, could see nothing, and by the strong refraction of the rays of light would be blinded, though their eyes are continually open and well formed, were not the crystalline humour almost spherical, in order the better to collect the rays of light. They have no eyelids, and they cannot draw back their eyes; but their cornea, which is almost as hard as a horn, preserves them from all danger. Formerly the mole was supposed to be blind, but it is certain that it has little black eyes, about as large as the head of a pin. As this animal is almost always under ground, it was necessary that his eyes should be very small, sunk in the head, and covered with hair.

We know that the eyes of snails are placed on the tops of their two long horns, and that they can draw them into their heads, or push them out to discover distant objects. In those animals which can neither move their heads nor eyes, this defect is compensated, either by the number of eyes, or by some other means. The spider has four, six, and sometimes eight eyes, all placed in the front of a round head, without any neck. They are clear and transparent, like a bracelet garnished with diamonds. According to the way of life and different wants of several kinds of spiders, their eyes are distributed differently in their heads, that they may see on

all sides; and without moving their head, may at once discover the flies destined to be their food.

Theameleon, a species of lizard, has the singular property of moving one of its eyes, while the other stands still; of turning one eye up and the other down; and of seeing what happens both before and behind it at the same time. Some birds have the same power; so also have hares and rabbits, whose eyes are very convex. This preserves them from many dangers, and enables them to discover their food with less difficulty.

All these examples, and they might be easily multiplied, show very plainly the tender care of the Creator for the preservation of the organs of the most necessary senses. He has been pleased to communicate the blessing of sight to his creatures, in a variety of ways; and we cannot but be struck with astonishment, when we consider the admirable art observed throughout; and the precautions which he has taken to keep his creatures in possession of this valuable gift, and to preserve it from the dangers to which it might be exposed. All parts of the bodies of animals are disposed in the most exact proportion, and in the most suitable manner to their different necessities, and the accomplishment of the ends for which they were designed. The situation of the eyes, their arrangement, their number, and their form, could not have been otherwise in any animal, without great inconvenience. For, it was not merely for ornament, but for the advantage of animals, that the Creator has so varied the structure and position of their eyes. And, undoubtedly, one of his designs was, that we might learn to acknowledge and celebrate his wisdom in all things. Let the foregoing reflections be applied in this way; and, when we seriously consider the wise ends which God has proposed in all his works, we shall be excited to magnify his power and goodness.

## SEPTEMBER IX.

## FISH.

Who would ever have thought that there were such creatures as fish if he had not seen them? If a naturalist only knew those animals which walk and breathe on the land, like the rein-deer, and were told that there were a species of creatures in the water so formed, that they could live, move, propagate, and fulfil all animal functions with facility and pleasure in that element; would he not treat the information as a vision, and conclude, from what happens to our bodies when immersed in water, that it would be impossible for any creature to live in that element?

The way in which fish live; their make, motion, and the propagation of their species, are all very wonderful, and afford fresh proofs of the omnipotence and infinite wisdom of our Sovereign Creator. That these creatures might be able to live in the water, it was necessary that their bodies should be differently constructed, as to their essential parts, from those of terrestrial animals; and we accordingly find this to be the case, on an examination of the external and internal structure of the bodies of fish. Why has the Creator given to most fish a tapering body, slender, flattened on the sides, and always pointed at the head, but that they might the more easily swim, and cut their way through the water? Why are they covered with scales of a horny substance, but that their bodies might sustain no injury by the pressure of the waters? Why are many fish, especially those which are destitute of scales, or which have only very soft ones, enveloped in a fat oily covering, but to preserve their tender substance from injury, and to keep them in a due degree of warmth? Why have they such cartilaginous and porous bones, but that their bodies may be more light and flexible? Why have all fish their eyes sunk into their heads, and why is their crystalline humour spherical, but that they may not be so easily injured, and that the rays of light may be better concentrated?

It is evident, that in the arrangement of all these parts, the Creator has had respect to the mode of life and destination of these animals.

But there are other circumstances equally admirable in the structure of fish. The fins are almost their only limbs, yet they are sufficient for all their motions. By means of the tail-fins they move forward. The back-fin directs the motion of their body; and they raise themselves by the breast-fin, while the belly-fin serves to hold them in equilibrio. The gills are their organs of respiration: they are situated behind the head; there are four on each side, the uppermost of which are the largest. They take in water continually by their mouths, which is their inspiration; they throw it out at their gills, which is their expiration. The blood which proceeds from the heart, and which is distributed through the veins of the gills, does not return through the lungs to the heart, as in terrestrial animals, but is directly dispersed through all parts of the body. One of the organs most necessary to fish in swimming, is the air-bladder, which is included in their belly, and communicates with their stomach. By means of this bladder they can make their bodies lighter or heavier, as they please. As soon as this vessel is inflated they become lighter, ascend, and can swim near the surface of the water; but when it is contracted, and the air compressed, their body becomes heavier, and they sink in the water. When this bladder is pricked with a pin, the fish falls immediately to the bottom, and cannot raise itself up to the surface again.

What farther merits our attention is, the prodigious number of fish; as also the great variety in their shape and size. In Germany alone there are more than four hundred different kinds of fish. And who can count the numbers in each species? Their external form is also greatly varied. Among fish we find the very largest, as also the smallest of animals. Some are long, and as fine as a thread; others are short and broad; others are flat, cylindrical, triangular, round, &c. There are some which are armed with a horn; others with a species of sword; and others with a kind of saw. Some have

nostrils through which they forcibly eject the superfluous water they have swallowed.

Which are we most to admire in all this, the power and wisdom of the Creator in the formation and preservation of these animals, or his goodness in giving them for our use? Everything must lead the attentive observer of the works of God to magnify his name. What magnificence does God manifest in all the elements, and in all animals, whether they inhabit the air, the earth, or the sea! In the whale, whose back is as an island in the midst of the waters; and in the gold fish, which glitters in the rivulets. And in all this how great is his goodness towards us! Of how many nutritive dishes should we be deprived if those extensive plains, on which neither trees nor fruit grow, were not peopled with creatures as prolific as they are delicious, and which amply satisfy our wants?

## SEPTEMBER X.

### THE PROPAGATION OF ANIMALS.

FORMERLY it was supposed that insects, vermin, and even some quadrupeds, were generated from corruption, without the interposition of animals of the same species. But this hypothesis, which is manifestly opposite to reason, is contradicted also by the most decisive experiments. It is now well known that all animals can produce their like, and that this propagation is generally effected in two ways: first, by laying eggs; secondly, by bringing forth the young alive. All the class of mammalia, or animals which give milk, are viviparous. All birds are oviparous; but their eggs must be impregnated by the male before they are capable of producing young. In most animals, it is essentially necessary that the female should receive the seminal fluid by junction with the male. Fish alone seem to be an exception to this rule. That they couple, has not yet been discovered: the males cast their liquor, which is either swallowed by the

female, or falling on the eggs which she has deposited in the water, impregnates them.

Fish are the most prolific of all animals. When we think of the many millions of herrings which are caught annually, we may be surprised that any should still remain. But the multiplication of fish is prodigious. It has been found, for instance, that the pike lays 300,000 eggs; the carp above 200,000, and the mackerel near half a million! The eel is viviparous. Most amphibious animals couple like others. Some, however, cast the seminal liquor like fish. Some are viviparous, others are oviparous; but the latter do not hatch their eggs, they leave them to the warmth of the air, or to that of the water; and sometimes they deposit them in heaps of dung.

Worms are viviparous and oviparous. In their generation there are many singular circumstances. The greater part, if not the whole, are hermaphrodites; and they can impregnate themselves, or mutually impregnate each other.

The distinction of sex is very evident in most insects: there are some, however, that have no sex; and others in which the two sexes are united in the same animal. Insects are in general oviparous; but there are some who bring forth their young alive. The eggs of the former are hatched by the warmth of the air; but in this class of animals a singular circumstance takes place, which at first sight might indicate that the male and female never copulate. The insect called the leaf-louse, or blight, is commonly viviparous. An insect of this class, taken at the moment of its birth, separated from all of the same species, and shut up in the most perfect solitude, will, nevertheless, produce young ones. This takes place as follows: In the spring, and during the summer, the females of this species bring forth their young without previous union with the male. Then they are viviparous. A single one may produce a hundred little ones in less than three weeks. All that are born in this season are females; the males come about autumn. Then they couple, and the females lay eggs, and thus cease to be viviparous. These eggs are hatched in the spring. Thus one junction of male and female serves, at least, for

ten consecutive generations, the individuals of which are impregnated with their mother's eggs!

When we reflect on this variety in the propagation of animals, we cannot but be struck with the wonders of the power and wisdom of God. The instinct which induces the two sexes to unite is admirable. This natural propensity is not produced by any external circumstance. It is manifested with as much energy in animals which live alone, as in those which are gregarious. The wisdom of the Creator is further evident in this, that generally the females have their set time of bringing forth their young. Wolves and foxes go to rutting in January; horses in summer; stags in September and October. Insects couple in autumn; birds, and most fish, in spring; the roebuck and dove, in September; cats in January, May, and September. If the coupling of animals did not take place at fixed times, the generations would be confounded, and the race itself would be injured.

Is it not astonishing, that while they enjoy their natural liberty, they do not mix in such a manner as to confound the different species, or cause the original genus to become extinct? Who can help admiring how exactly the organs of generation in animals of the same species are suited to each other, and not at all adapted to creatures of a different order; but exactly calculated to accomplish that multitude of particular ends, which all unite in one grand general purpose, viz., the constant preservation and multiplication of every species of animals?

How blind must those men be, who, in all this, will not acknowledge the wisdom of God, but ascribe the whole to chance! Hoping that the reader does not belong to this class of men, he is invited to contemplate the divine wisdom, so evidently manifested in the propagation of animals. These meditations may not only be pleasing in themselves, but also furnish us with motives to love that God, who, for the good of the world and the benefit of man, has provided with so much wisdom for the preservation and multiplication of animals.

## SEPTEMBER XI.

THE INFLUENCE OF THE MOON ON THE HUMAN  
BODY.

FORMERLY certain influences were ascribed to the moon which were well calculated to nourish superstition, and excite groundless fears. The gardener would not plant till he had made observations on the moon. The husbandman deferred sowing till he was well assured of the happy influence of this planet. Sick people attended with the most scrupulous exactness to the variations of the moon; and physicians themselves paid attention to these in all their prescriptions. These prejudices, however, have lost ground by degrees; at least, it is certain, that the empire of superstition, relative to the influences of the moon, is not so universal as it was formerly. This is one of the many advantages the present age has over the past; an advantage too little considered, but which merits our warmest gratitude to God. It is the duty of every person to render this still more extensive; and to labour as much as possible to extirpate ancient superstitions.

With regard to the effects of the moon upon our bodies, it is best to preserve a just medium; for, as it would be unreasonable to attribute to that planet too great an influence over the human body, it would be no less rash to deny it any. It must be allowed that the moon occasions great changes in the air, and consequently may produce several alterations in the state of our bodies. The moon may cause considerable emotions and alterations in the superior part of the atmosphere; so as to occasion earthquakes, winds, heat, cold, exhalations, mists, &c.; and on this account the health of our bodies may greatly depend on the influence of the moon. It is observed that people who have certain infirmities feel acerbations, and more acute pains, at the change and full of the moon. And this is not to be wondered at; for it is true that cold and damp air, foggy and stormy weather, have a different effect on our health, from a warm,



dry, pure, and serene air. The moon must have considerable influence over the animal economy, seeing she produces such alterations in the temperature of the air. The action of this planet on the human body is founded on a principle that cannot be contested ; it is this : That our health depends, in a great measure, on the state of the weather, and the constitution of the air we breathe ; and no person can deny that the moon may cause many derangements in the atmosphere. Possibly there may be in the human body a flux and reflux occasioned by the moon, analogous to that which she produces in the sea. Why do most periodical diseases return at the end of four weeks, rather than at a longer or shorter period, if they have no relation to the influences of the moon on the human body?

In general, it is a principle which we ought to admit, to the glory of our wise Creator, that in all natural things there are certain relations which influence the animal economy in a variety of ways. There are, doubtless, various wonders in the atmosphere which are still unknown to us, and which occasion many important revolutions in nature. Who knows but many phenomena of the corporeal world, which we either think nothing of, or attribute to some other cause, depend on the moon ? Possibly the light with which she favours us during the night is one of the least of the purposes for which God formed this planet. Perhaps her being placed so near the earth was to produce on it certain effects, which the other planets could not do because of their distance. At least it is certain that everything in our system stands in some kind of relation to our globe. And it is this particularly which shows the world to be such a masterpiece of the divine wisdom. The beauty of the universe consists in the diversity and harmony of its component parts ; in the number, nature, and variety of their effects ; and in the sum of good which is the result of all these combinations.

How then can the influence of the moon and stars create superstitious ideas and fears in our hearts ? If we believe that God has planned the whole, that he has established the connexions which subsist between all the globes, how can we indulge vain terrors, which are so

contrary to the ideas we should form of the divine wisdom? If we be truly persuaded that this Supreme Being governs all things with infinite wisdom and goodness, is it not natural that we should trust in him, and confide with tranquillity and joy in his good providence?

## SEPTEMBER XII.

## THE IGNIS FATUUS.

THE Ignis Fatuus, vulgarly called Will-with-the-Wisp, or Jack-a-lantern, is a little light flame which skips about in the air, a few feet from the ground, and which appears to go hither and thither at random. This fire seems to disappear and go out suddenly, probably when brakes and bushes hide it from the sight; but it is soon rekindled in other places. Such fires are seldom to be seen in cold countries; and we are assured that in winter they are only to be seen in marshy places. In Spain, Italy, and other warm countries, they are met with in all seasons; and are neither extinguished by wind nor rain. They are seen most frequently where there are putrefied plants and animal substances; as in churchyards, common sewers, and in fat and marshy ground.

Too few experiments have been made on these aërial fires to determine with any precision on their nature. But the places where they are generally seen may lead us to very probable conjectures. For as they almost always appear in marshy countries, it is natural to suppose that they are ignited sulphureous exhalations. It is well known that dead carcasses and rotten plants sometimes emit light. Probably the ignis fatuus is nothing else than exhalations condensed by the cold of the night, or is owing to a weak kind of electricity, produced by the inward motion of the exhalations which float in the air. Horses, dogs, cats, and even men may become electric, and emit sparks when they are rubbed, or put in motion in a particular way. May not the same thing happen to certain places of the earth? It may so hap-

pen that a field, through particular circumstances, may be electrified in some parts, and then it is not astonishing that it should become luminous. The air itself may produce the *ignis fatuus*, when it is electrified to a certain degree.

If the manner in which these aërial fires are produced be still uncertain, it is at least indisputable that they are effects of natural causes ; and consequently, we need not have recourse to superstition. Superstitious people look on these flames with so much terror, that few have courage enough to approach them. Many believe them to be departed souls or malignant spirits, which wander about, and which take pleasure in leading travellers astray during the night. What may have given rise to this superstitious notion is, that the *ignis fatuus* follows all the motions of the air, and thus it seems to fly from those who pursue ; and, on the contrary, follows those who run from and wish to escape it, and sometimes sticks to coaches, &c., which drive swiftly. But the reason of these phenomena is very evident, for the person who runs after one of these fires drives the air before him, and consequently the fire, which follows all its motions ; whereas the person who flies leaves an empty space, which the surrounding air incessantly rushing in to supply, a current is formed which has its direction from the fire to the person who runs, and this necessarily leads on this light flame. This also is the reason why the fire stops when the person ceases to run ; because the motion of the air then ceases.

How many persons torment themselves with vain alarms, which have no other ground than a disordered imagination ! We might save ourselves from many fears, if we would take a little more trouble to examine the objects of our terror, and search out their natural causes. Nearly the same things happen to us in a moral sense. With what ardour do men pursue the goods of fortune, without examining whether they deserve this anxiety, or can afford us the happiness we expect from them !

Most ambitious and covetous people are as unsuccessful in the pursuit of honours and riches as Robert Flood, who used to run after the *ignis fatuus* without ever being

able to catch it. What do we gain in the end by the continual efforts we make to acquire those goods, which both in their nature and duration so exactly resemble the *ignis fatuus*? Commonly terrestrial good flies away from him who pursues it, and falls to the lot of those who wish to avoid it.

## SEPTEMBER XIII.

## THE MINERAL KINGDOM.

IN order to procure wholesome and convenient dwellings, men require many materials. If these materials had been scattered over the face of the earth, it must have been covered with them, and no room would have been left for animals and plants. Our earth is happily free from such incumbrance. Its surface has been left open, and it may be cultivated and traversed by its inhabitants without any hinderance. Metals, stones, and a hundred other matters which we continually use, are shut up under our feet in immense cellars, where we find them whenever we want them. These matters are not hidden in the centre of the earth, nor at an inaccessible depth, but are purposely brought near the surface, and placed under a vault, which is at once thick enough to produce sufficient nourishment for men and animals, and thin enough to be easily dug through, when we need to go down and bring up some of the innumerable articles deposited in this vast magazine.

All the substances in the mineral kingdom may be divided into four classes; each of which has its distinguishing characteristic. The first includes earths. This name is given to those bodies which cannot be dissolved either by fire, or in oil, which are not malleable, and which stand the action of the fire without losing any of their substance. To this class belong, not only the simple earths, but also stones, which are composed of these earths. There are two kinds of stones, the precious and the common. The latter are the most numerous, and present themselves to us in masses, different in form, size, colour, and hardness, according to the earths, sul-

phurs, &c., of which they are composed. Precious stones are also in great variety. Some are perfectly transparent, and appear to be the most simple. Others are more or less opaque, according as they are composed more or less of heterogeneous particles.

Salts form the second class in the mineral kingdom. They include those bodies which are soluble in water, and which leave a relish on the tongue. Some melt in the fire, and others remain in it unaltered. They are divided into acids, which are sharp and sour, and alkalis, which leave on the tongue a bitter, burning, and lixivial taste. These have the property of changing all blue vegetable liquors into green. From an exact and proper mixture of these two salts with each other, neutral salts are produced. Among these the common or kitchen salt is reckoned, which is either extracted from the earth, or prepared with sea-water; or obtained by the evaporation of brackish fountain water, in large caldrons over a fire. All these salts are one of the principal causes of vegetation. They also serve probably to unite and strengthen the parts of plants, as well as of other compound bodies. Finally, they produce fermentations, the effects of which are very different and numerous.

The third class of the mineral kingdom comprehends inflammable bodies, to which the general name of bitumens has been given. They burn in the fire; and when they are pure they dissolve in oils, but never in water. These bodies are distinguished from other minerals, by containing more of that inflammable quality which renders those substances combustible, where they are found in sufficient quantity. There is less or more of this substance in almost all bodies.

The fourth class of the mineral kingdom contains metals. These are bodies much heavier than the others; they become fluid in the fire, but resume their solidity when cold. They are bright and malleable. Among metals, some are found which when melted suffer no diminution of weight, nor any other sensible alteration; these are termed perfect metals. Of this sort there are three, gold, silver, and platina. The other metals, which are called imperfect, are decomposed more or less speedily

by the action of the fire, and commonly change into a calx. One of them, lead, has the property of being converted into glass, and of vitrifying all the other metals, gold and silver excepted. The imperfect metals are five in number, viz., quicksilver, lead, copper, iron, and tin. But there are other bodies which are distinguished from metals, not being ductile nor malleable: these are called semi-metals, and are nine in number; viz., arsenic, molybdena, tungstein, manganese, nickel, cobalt, bismuth, antimony, and zinc. This classification has been superseded by one much more ample and accurate. It is as follows:—See *Parks's Chemical Catechism*.

The general characters of metals are hardness, tenacity, lustre, opacity, fusibility, malleability, and ductility. They have been divided into seven classes:

1. Metals which combine with oxygen, and form alkalies. Of this class there are three in number, potassium, sodium, and lithium.

2. Metals which, combining with oxygen, form the alkaline earths. These are four in number, calcium, magnesium, barium, and strontium.

3. Metals which, combining with oxygen, form the remainder of the earths; viz., silicium, aluminium, zirconium, glucinum, ittrium, and thorium; six in number.

4. Metals which absorb oxygen, and decompose water at a high degree of temperature; viz., iron, zinc, cadmium, tin, and manganese; five in number.

5. Those metals which absorb oxygen at different temperatures, but do not decompose water at any temperature; viz., osmium, cerium, tellurium, titanium, uranium, nickel, cobalt, copper, lead, antimony, bismuth, and mercury. These are twelve in number.

6. Those metals which do not decompose water, but absorb oxygen, and are thereby converted into acids. These are six in number; arsenic, molybdenum, tungstein, chromium, columbium, and selenium.

7. Those metals which do not decompose water, nor absorb oxygen at any temperature. These are six in number; platinum, gold, silver, palladium, rhodium, and irridium—making forty-two in number, all distinct in their characters and qualities, as specified above. Menachanite is another name for titanium.

The whole mineral kingdom is the workshop of nature, where she labours in secret for the benefit of the world. No naturalist has yet been able to surprise her in any of her operations, and steal from her the art with which she assembles, prepares, and composes her salts, earths, bitumens, and metals. If we cannot guess how nature employs the substances which are daily produced, it is not less difficult to discover how the parts associate, combine, attenuate, and finally form the different bodies which the mineral kingdom presents us. We have but a very imperfect knowledge of the surface of the earth; and we are still less acquainted with the interior parts. The deepest mines are not more than about 630 fathoms, which is not the six thousandth part of the earth's semi-diameter. This alone is sufficient to show how impossible it is to have an exact and perfect knowledge of nature, and the formation of the different substances in the mineral kingdom. Happily, in the use which we make of the gifts of nature, it is of little consequence whether we exactly know their origin and first principles or not. It is enough that we have the knowledge necessary to apply them to our use. We know enough to glorify our Creator, seeing we are convinced that there is not a point, either on or under the earth's surface, where his power, wisdom, and goodness are not particularly manifested.

## SEPTEMBER XIV.

### SOME OF THE PRINCIPAL EXOTIC PLANTS.

WE do not pay sufficient attention to the gifts of God, and particularly to those which come to us from distant countries, and which are now become so necessary. If we considered what trouble it costs, what wheels, so to speak, must be put in motion in the great machine of the world, and how much strength and industry it requires to provide us a little sugar or cinnamon, we should not receive the gifts of God with such indifference as we generally do; but, on the contrary, we should look up to that Supreme Being with gratitude,

who uses so many means to convey his blessings to us. At present, let us consider those foreign productions which are become necessities of life, and which would be so difficult for us to dispense with. Perhaps some useful reflections may arise from this; and we may think at least with concern on our ill-fated brethren, the miserable slaves, whose severe labour procures so many luxuries for us.

Sugar is properly the salt which is found in the juices or marrow of a certain reed, which is cultivated principally in Brazil, and in the neighbouring islands; but which is also found in abundance in the East Indies, and in some of the African islands. The preparation of sugar does not require much art, but it is extremely laborious, and it is slaves alone who are generally employed in this painful business. When the canes are ripe, they are cut and carried to the mill to be bruised, that the juice may be extracted from them. The juice is first boiled, without which it would ferment and grow sour. While it is boiling, they scum it to take off any dirt; and this boiling is repeated four times, in four different cauldrons. To purify and clarify it still more, they throw into it a strong lye of wood-ashes and quicklime; finally, they cast it into moulds, that it may coagulate and dry.

Tea is only the leaf of a shrub which grows in Japan, China, and other Asiatic countries. These leaves are gathered three or four times during the spring. Those of the first gathering are the finest and most delicate. This is what is termed imperial tea, but it never comes into Europe. That which the Dutch sell under this name is only of the second gathering.

Coffee is the kernel of a fruit similar to a cherry. The tree which bears it is a native of Arabia; but it has been transplanted into many warm countries. Next to Arabia, the best place for its cultivation is the island of Martinique. The kernel which is found in the midst of the fruit we call berry; when fresh, it is yellowish, or grey, or of a pale green; and it preserves this colour pretty well when dry. The fruit is spread on mats, that it may be dried in the sun; and it is afterwards bruised with rollers to separate the kernels from the fruit; hence



it is that each berry or kernel is divided into two. The kernels are once more dried in the sun before they are put on shipboard.

Cloves are the buds or dried blossoms of a tree which formerly grew without culture in the Molucca islands; but the Dutch have transplanted it to Amboyna. This tree is of the form and size of the laurel. Its trunk is covered with bark like that of the olive. White flowers grow in bunches at the end of the branches, which have the appearance of nails. The buds are at first of a pale green, afterwards they become yellow, then red, and lastly, of a black brown, such as we see them. They have a more penetrating and aromatic smell than the mother clove, a name which distinguishes the dry fruit of the tree.

Cinnamon is the second or inner bark of a species of bay-tree, and which at present grows almost nowhere but in the island of Ceylon. The root of the cinnamon-tree is divided into many branches, and covered externally with a greyish bark, but with a red bark within. The leaf would bear a very near resemblance to that of the laurel, were it a little shorter and more pointed. The blossoms are white and small, of a very agreeable smell, like that of the mayflower. When the tree is some years old, they separate the two barks; the outer bark, being good for nothing, is thrown away; the inward bark is dried in the sun, and rolls itself up about the size of a finger, and this is what we call cinnamon.

Nutmegs and mace are the produce of a tree which grows in the Molucca islands. The nut is covered with three rinds; the first falls of itself when the nut is ripe; the second then appears, which is very thin and fine; it is taken off the fresh nut with a great deal of care, and exposed to the sun to dry. This is called *mace* in the Molucca islands, and is here improperly termed the nutmeg-blossom. The third bark is the inner coat of the nutmeg. The nut is taken out of its shell, and put in lime-water, in which it remains for some days, by which time it is well prepared, and fit to be sent abroad.

Cotton grows in most parts of Asia, Africa, and America. It is the fruit of a sort of pod, which opens when ripe, and presents a wad or lump of down ex-

remely white. This is called cotton. When this wad swells with the heat, it becomes as large as an apple. With a little mill, they cause the seed to fall on one side, and the cotton on the other. It is afterwards spun for all kinds of work.

Olive oil is the expressed juice of the fruit of the olive-tree ; whole forests of which may be seen in France, Spain, Portugal, and Italy. The inhabitants of the provinces where these trees abound make use of the oil instead of butter, as they have very few cows ; the extreme warmth of the earth preventing the growth of the grass.

Pepper is the fruit of a shrub, the stem of which requires a prop to support it. The wood of it is knotty, like a vine, to which it bears a near resemblance. Its leaves, which have a very strong smell, are oval, and terminate in a point. In the middle and at the extremity of the branches there are white flowers, whence the fruit grows in bunches similar to gooseberries ; each fruit bears twenty or thirty peppercorns.

It is not a little satisfaction to a reflecting mind, to think of the great number of aliments designed, not only to supply our necessities, but also to please our palate. Let us consider those blessings which the divine bounty grants us in such abundance. Every country contributes to furnish us with the necessities and conveniences of life. The inhabitants of the most remote climates labour for us ; the miserable slave, who deserves to eat in peace and quietness the fruit of his labours, prepares, at the expense of his sweat and ease, those luxuries which we consume with so much profusion. If we do not think of our heavenly Benefactor, let us think at least of the instruments which he uses to procure us a part of our subsistence. But how can we forget that God who furnishes our table from all parts, and shows his goodness towards us from every quarter of the globe ?

## SEPTEMBER XV

## REFLECTIONS ON MYSELF.

I LIVE; my blood circulates, without any concern of mine, through arteries and veins, arranged and protected with wonderful art. I can enjoy the sweets of sleep; and in a state in which I am ignorant of myself, in this body, which appears without motion or life, my soul still exists! I awake; my senses resume their functions, and my soul receives clearer and more lively ideas. I eat, I drink; and surrounded on all hands with the beauties and riches of nature, I feel a thousand pleasing sensations. Am I the cause of these effects? Did I give my first principles, the first rudiments of my body, this wonderful motion, when I was plunged in the night of nothing, and when I knew not what night was? Did I form the many different parts of my body, I, who even at present know neither their arrangement nor combinations? Was I more knowing, more expert, when I had no existence? or did my existence precede that of my thinking principle? How is it that I cannot determine the point which separates sleep from waking? What is the mechanism of my stomach, which digests food without my command, and without the smallest co-operation on my part; and how is it that this digestion is effected? How is it that all the creatures of the same species are formed as I am; and why am I not formed in some other way? Is it I who have created all the beauties of nature, or have they produced themselves? What makes me susceptible of pleasure and pain? Who causes bread and water to spring up from the earth, that my body may not pine away, that the motion of my limbs may not be stopped?

Who causes the rays of light to fall on my eyes, that I may not be encompassed with perpetual darkness? Whence proceed the blessings which I experience? the pain and grief of which I am sensible? Why am I not always happy? And why have I been so cruel to myself as to form myself with so many imperfections? Does every thing proceed from me? Have I a suffi-

ciency of power and activity for this? And are my fellow-creatures which I have seen, do see, and may yet see, endued with the same faculties? Extravagant and contradictory thoughts, which discover the perverseness of those who indulge them. My soul, notwithstanding all its imperfections and limited state, attests the greatness of that Being who has created it; a Being necessarily self-existent and infinitely perfect; on whom I am entirely dependant. This body which I bear, and of whose structure I am ignorant, proves that there must be a wise workman, whose greatness my feeble intellect cannot fathom, who has made and arranged these muscles, nerves, veins, and all the parts which my body is composed, in so wonderful a manner.

How could man, that weak and limited creature, plan and execute the original of such a machine, so complex and so artfully constructed; whose parts are connected together with so much harmony; he who is not capable of even taking an exact copy of this original? There is not the smallest particle of our bodies for which there is not a sufficient reason, and which is not absolutely necessary, or becomes so by the connexion it has with other parts. Experience as well as reason proves this beyond a doubt. And certainly the Creator must be infinitely great, seeing I am not the only creature who can boast that I am formed with so much wisdom, and with such admirable art. Millions of my fellow-creatures, innumerable multitudes of animate and inanimate beings, seem to call upon me with one voice, "Behold the Invisible, acknowledge him in his works! See how his greatness and perfections are manifest in us all, and in thyself. Behold! the most insignificant of us lives as well as thou; it has received, as well as thou, both being and motion. O bless him, who has formed us all in so wonderful a way!"

To thee, O God, the adorable Author of my existence, I owe eternal thanksgiving. It is by thee I live, in thee I move, and from thee I have my being. It is through thy goodness that my soul thinks and reflects, in a healthy body; it is to thee alone that I owe all the pleasures which the surrounding creatures afford me. It

is by thy command that all nature inspires me with joy. Thou waterest the earth, that it may be fruitful; and that I perish not through lack of sustenance. Thou art he whom I and all intelligent beings adore; thy goodness, wisdom, and providence I bless, and recommend myself to thy paternal care for the future. Thou knowest all men, thou hast thy eye upon them, and observest all their actions. Thou dost not desire that we should pass our time in darkness and distress, and that we should consider our existence as a curse; thou permittest us to enjoy, with a grateful heart, the innocent pleasures of life.

When the bird in the air astonishes me with the rapidity of its flight, the elegance of its form, and the sweetness of its notes, is it not right that I should consider it as thy work, that its songs are so many hymns to its Creator, and that they should excite me to praise thee? Thou providest food for it as well as for me. It is nourished by seeds, which thou causest to grow for it, as I am by the corn which appears to rot in the earth, but which, at thy command, becomes the support of my life. Thou sendest the rain and the beams of the sun upon the earth, to cause it to produce the most delicious fruit, while the utmost of my efforts could not produce a single blade of grass! It is not merely the necessities of life which thou grantest us, thou givest us besides what the world calls fortune, riches, and happiness. Thou directest events so, that even those which appear the most unfortunate, often contribute to our happiness. In a word, after having formed us in so admirable a manner, thou preservest us by a continual series of miracles.

O that the precious though short hours of my earthly pilgrimage,—those hours which can never return,—may be employed in such a manner as may best answer the design of my existence, that when I leave this world I may enter into a more blessed state, and be better able to fathom the mysteries of nature and grace! May the contemplation of thy wonders, accompanied with the influences of thy Holy Spirit, excite me to celebrate thee, who art my Creator and Redeemer! May I praise thee

through all eternity, who art the Being of beings, and the sovereign good of all thy creatures !

## SEPTEMBER XVI.

### THE STRENGTH OF THE HUMAN BODY COMPARED WITH THAT OF ANIMALS.

ALTHOUGH the human body is externally more delicate than that of other animals, it is nevertheless very nervous, and probably stronger in proportion to its size, than that of the most vigorous creatures. For, if we compare the strength of the lion with that of man, we should consider, that this animal being armed with claws, we are apt to form a false idea of his strength, by the use he makes of them ; and we attribute to his strength what properly belongs to his weapons. But there is a better method of comparing the strength of men with that of animals, and this is by the weight they can carry. Were it possible to unite in one point, or to collect into one effort, all the particular exertions made by an ordinary man in the course of a single day, we should find that such a person would be able to lift every day a weight equal to 1,728,000 pounds a foot from the ground, without any injury to his health. In general, people accustomed to hard labour can easily carry a burden of 150 or 200 pounds weight. And common porters often carry burdens from 700 to 800 pounds weight. In London, those who work at the quays, in loading and unloading ships, sometimes carry burdens too weighty for an ordinary horse.

The size of a man's body is in proportion to that of a horse, as one is to six or seven. If then the strength of the horse were in proportion to the strength of a man, he would be able to carry a load from 12,000 to 14,000 pounds weight ; but there is none that can carry such a burden ; and it is certain that the horse's strength, if not less, is only equal to that of man, the proportion of size being considered. A learned Frenchman has made an experiment to ascertain the strength of the human body ; he had a sort of harness made, by means of which

he placed on every part of a man, standing upright, a certain number of weights, so that each part of the body supported as much as it could bear, relatively to the rest ; and there was no part but what had its due proportion of the load. By means of this machine, without being at all overburdened, the man carried a weight of 2000 pounds !

We may also judge of the strength of man, by the continuance of his exercise, and the lightness of his motions. Men who are accustomed to hunting, outrun horses, and can bear the exercise longer ; and even in more moderate exercise, a man accustomed to walk will travel each day much farther than a horse can. And were each to go only the same number of miles in the day, the horse would be found entirely exhausted with fatigue, when the man would be capable of continuing his journey without any inconvenience. At Ispahan, couriers go nearly 130 miles in ten or twelve hours ! Travellers inform us that the Hottentots outstrip lions, and that the American savages who hunt the Orignal, pursue these animals, though as fleet as stags, till they tire them down, and catch them. A thousand other things are reported of the fleetness of the savages, of the long journies which they undertake and accomplish on foot, over the most rugged mountains, and through trackless, uncultivated deserts. It is said that these men perform journies of five or six thousand miles in six weeks or two months ! There is no other creature, birds alone excepted, that can perform such journies as these. Men in a state of civilization do not know their own strength, how much they lose by effeminacy, and how much they might acquire by habit and vigorous exercise. Sometimes we meet with men of extraordinary strength ; but this gift of nature, which would be so valuable were it to be employed in their own defence, or in useful labour, is of little advantage in civilized society, where genius does more than bodily strength, and where manual labour devolves on the lowest orders of society.

Here again we must acknowledge the admirable wisdom with which God has formed the body, and rendered it capable of such activity. But at the same time, we should pity those indolent men who spend their lives in

idleness, sloth, and effeminacy, and who cannot be persuaded to use their strength for fear of injuring their health, or destroying their lives! But why has God given us such strength, if not to use it? While then we consume it in effeminate sloth, we refuse to obey the command of our Creator, and render ourselves guilty of unpardonable ingratitude.

May we henceforward use all our strength for the benefit of our fellow-creatures, according to the situation in which God has placed us in this world; and if circumstances should require it, let us earn our bread by the sweat of our brow. Are we not happier than thousands of our brethren who are worn out with labour and fatigue—who groan under the insupportable yoke of slavery—whose honest foreheads are bathed in sweat—and who, when their strength is nearly exhausted, have no means of procuring any comfort or ease to their oppressed bodies. The more happy we find ourselves when compared to these, the more we should apply ourselves to fill up all our duties; and the success of our labours should lead us to praise God with grateful hearts, who has condescended to grant that strength which was necessary, and to preserve it to us to the present time.

## SEPTEMBER XVII.

### THE INSTINCT OF THE BUTTERFLY RELATIVE TO THE PROPAGATION OF ITS SPECIES.

At this season of the year, butterflies begin to disappear from the creation; but the race is not extinct. This insect lives in its posterity, and by a wonderful instinct takes care to provide for the preservation of its species. From their eggs new generations spring. But where do they lay their eggs at the approach of the inclement season? And how can they protect them from the rains of autumn and the frosts of winter? Are they not in danger of being drowned or frozen?

That beneficent Being, who gives wisdom to man, has also condescended to instruct the butterfly how to secure



that only legacy which she can leave to the surviving world, by covering over her eggs with a gluey substance, which proceeds from her own body. This species of glue is so very tenacious that the rain cannot penetrate it, and that the ordinary cold of winter cannot kill the young ones which are included in the eggs. But it is remarkable, that though every species follows the same method from generation to generation, yet there is a great diversity in the measures which different species of the butterfly take for the preservation of their race. Naturalists inform us that some of these insects lay their eggs in the beginning of autumn, and then die, lying over and glued to their dear offspring. The sun, which has still considerable power, warms their eggs; and before winter, a numerous troop of little caterpillars are hatched, which immediately begin to spin, and make themselves very spacious nests of this thread, in which they pass the cold season without eating, and almost without motion. When we open these nests, we find that what they have spun serves them for tent, curtains, and mattress. It is still more remarkable that the butterfly, as well as other insects, lays its eggs only on select plants, such as are suitable to its young, and where they may find food whenever it becomes necessary; thus, as soon as they are hatched, they are encompassed with those aliments which are fit for them, without being obliged to remove before they are able to take long journeys.

All these things, and many others of the same nature, are well calculated to cause us to admire the wise plans of an all-preserving Providence. If miracles, and things absolutely out of the common course of nature, were not necessary to affect and render us attentive, the consideration of that care which these insects take of their young (cares so various in the different species, but always so regular and uniform in each in particular) would fill us with the greatest astonishment.

Let us, who are rational beings, learn from these little creatures to preserve in our hearts a love for our posterity, and to interest ourselves effectually for those who are to come after us. In the projects and enterprises which we form, let us not be discouraged with the thought that

death may overtake us before we have accomplished our designs. Let us remember what we owe to society ; and that we ought at least to take as much concern in what relates to posterity, as those who have gone before took in matters relative to us. It is particularly the duty of parents to learn from the mother butterfly to provide for the children which shall survive them, and to place them beforehand in the best situation they can. Doubtless we cannot foresee, nor consequently prevent, the wants and afflictions to which they may be exposed, through unavoidable accidents ; but at least we should take care that their condition should not become miserable through our neglect. Would to God that all parents concerned themselves as much as they ought with the future happiness of their posterity ; that they would not be so imprudent as to leave their families in disorder ; that they would regulate their domestic affairs so well, that after their death their children might not be exposed to vexatious embarrassments ; that they might not have the mortification to see strangers consuming their goods, and enjoying their inheritances !

## ELECTRICITY.

WHEN we turn our attention to the improvements which have been made by the human mind in science, and the arts of civil life, and which have been published in the page of history and in the monuments of ancient times ; and also observe the increase and expansion of which the understanding and mental powers of man are capable, and which they often exhibit ; and then view the full standard, summit of perfection, and constant sameness and uniformity in the character and conduct of all other animals, in all ages ; we cannot but be sensible of the amazing advantages and powers bestowed on us by our beneficent Creator, giving us a decided and almost unlimited superiority over the several races of animated beings which people the earth.

The science of electricity will serve to illustrate and confirm this observation.

Before the close of the sixteenth century, little more

was known of this science than that amber (in Greek, *electron*), and a few other bodies, when rubbed, acquired the power of attracting bits of feathers, silks, and other light substances. At that period, it was found that the same property belongs to a very great number of bodies, and the subject was much investigated during the seventeenth century. A multitude of important discoveries relative to the electrical properties of bodies, marked the progress of the last and of the present century.

A peculiar fluid, called the electric fluid, abundant in nature, has been exhibited to the senses. By the electrical machine, it is excited, and accumulated on insulated conductors, and may be brought off in a dense visible spark, with a snapping noise, striking the hand, if that receive it, with considerable force. When powerfully excited, a peculiar sulphureous smell is perceived by those who are near the machine.

The grand discovery that certain bodies readily admit a passage to the fluid, and that other bodies arrest its progress, paved the way to still greater advancements in the science.

Soon after this it appeared, that although different bodies, on being rubbed, exhibited similar electrical appearances, yet a material difference, in certain circumstances, was evident; the effects of excited vitreous substances, and those of resinous ones, counteracting each other. It was concluded that there are two electric fluids; but it was afterwards shown that both could be obtained from either of the two kinds of substances alone. This removed the necessity of supposing the existence of two distinct fluids; yet that notion is still retained in the opinions of several cultivators of the science.

It soon became known that the electric power may be condensed on the surface of coated electrics, and accumulated in great quantity by employing an extensive surface of coated glass.

The identity of this fluid and lightning was demonstrated; and hence our knowledge of that wonderful and awful phenomenon, the voice of God speaking in the clouds, was brought down to our comprehension. By this means we are delivered from many shackles of superstition, too frequently imposed by designing men.

But the progress of the science was not arrested here ; the present century opened with the complete development of a new method of exciting this subtle fluid. When dissimilar metals are associated, electrical action takes place, and particularly so when certain fluids intervene ; and the accumulated power of many such combinations may be concentrated and conveyed through metallic wires or proper conductors. Electricity excited in this way, formed a new branch of the science, called Galvanism, from the discoverer.

This discovery has opened a new prospect of the works of God in the creation.

The electric fluid, through the medium of an apparatus constructed on this principle, is found to separate the elements of bodies, conveying those elements to the opposite sides of the apparatus. By it, inflammable bodies, and even metals themselves, are deflagrated, and an intense degree of light and heat produced.

Thus is our knowledge of the nature of bodies greatly extended, the various uses of their several sorts better known, and the means of directing our labours to the best advantage greatly increased. This science is still making rapid advances ; almost every year presents us with something new, interesting, and useful in this branch of knowledge.

How lamentable it is that any man should prostitute the powers of his intellect to unlawful pursuits, while God and nature have furnished ample and useful employment for all his faculties !

Surely we ought to employ the understanding with which God has furnished us to search and know what is his will, and how we may please him ; and when we consider the vast knowledge of which we are capable, we should reflect, that our greatest light is but comparative darkness, and that as yet we only know in part, and view only the surfaces of things.

## SEPTEMBER XVIII.

## THE VINE.

WE need only reflect on the vine to be convinced that complaints against the inequalities of the ground are ill-founded and unreasonable. The vine never thrives in a flat country ; neither does every hill agree with it, but only those which look towards the east or south. Hills may be considered the bulwarks of nature, which she invites us to garnish, as we do our fruit-walls, where the strength of the reflected heat is found united to the goodness of the open air. The most barren hills, and those steep grounds where the plough cannot go, are every year covered with the most beautiful verdure, and produce the most delicious of all fruits. If the soil that nourishes the vine appear so poor and unsightly, the plant which produces the vine is not more promising in its appearance. Who could have believed that the meanest, most deformed, most brittle, and useless wood in the world, could have produced a liquor so precious, had not experience proved it ? And yet, such is the vegetative energy of the vine that the sap flows through with six or eight times the force the blood does in the veins of animals. Farther, the evaporation of the vine is so great that to supply what is exhaled through the leaves, 152 inches of sap must rise in this tree in the space of twelve hours ! Who has endured the vine with qualities so superior to the meanness of its origin, and the barrenness of its native soil ? Who gave it such spirit and energy, which not only preserve it for many centuries, but even enable it to acquire new degrees of strength ?

With what wisdom also has God distributed vineyards over the earth ! They do not succeed equally in all places ; they require to be situated between the fortieth and fiftieth degrees of latitude, about the middle of the globe. Asia is properly the country of the vine, whence its cultivation has gradually extended to Europe. The Phœnicians, who travelled very early over all the coasts

of the Mediterranean Sea, brought it to most of the isles and to the continent. It succeeded wonderfully in the isles of the Archipelago, and was thence carried into Italy. The vine was there greatly multiplied; and the Gauls, having once tasted this liquor, determined to possess the country where it was produced; they therefore passed the Alps, and conquered both sides of the Po. Shortly after, the vine was cultivated in every part of France; and at last, on the banks of the Rhine, the Moselle, and the Neckar, and in other parts of Germany.

These observations may give rise to many important reflections. As the most barren soils are the best for the cultivation of the vine; so it often happens that countries the most impoverished are most favourable to the cultivation of the arts and sciences. In provinces universally despised for their poverty, men of genius have arisen, whose knowledge has illuminated other countries. There is no place so desert, no town so small, no village so despicable, in which certain branches of science may not be cultivated with success. Encouragement is all that is wanting. And how abundantly useful might we be, did we take a little pains to promote, as much as possible, the cultivation of the human heart! Sovereigns, preachers, instructors of youth, how much might you contribute to the happiness of your contemporaries and posterity, if, by rewards, exhortations, useful establishments, and similar encouragements, you would endeavour to bring back religion, science, and the social virtues, into ruined cities and wretched villages! Efforts for these purposes are never entirely useless. Either we meet the recompence ourselves, or our descendants gather the fruits of them. At least we shall be classed with those respectable men, who, in becoming the benefactors of the human race, secure the approbation of God, and the blessing of their fellow-creatures.

The vine, with its dry and shapeless wood, is an emblem of those who, though destitute of the outward splendour of birth and dignity, are, nevertheless, exceedingly useful. How often does it happen that men who live in obscurity, and whose external appearance promises nothing, perform actions and execute enterprises

which elevate them far beyond the sovereigns of the earth ! Let us here reflect on Jesus Christ himself ; to judge of him, from the abject state in which he appeared, we should never have expected such great and astonishing miracles, and works so beneficial to the human race. This Jesus, who like the unpromising vine was planted in a barren soil, has borne fruit for the blessing and salvation of the whole earth ! He has showed us that a man may be poor, despised, and miserable in this world ; and, nevertheless, successfully labour for the glory of God, and the good of mankind.

### SEPTEMBER XIX.

#### A HYMN TO CELEBRATE THE WORKS OF CREATION AND PROVIDENCE.

PRAISE our God ! Let all people celebrate him with songs of joy ! Sing aloud, and magnify his power and goodness ! Adore him ! Bow down before Him ! Celebrate, exalt, and glorify the King of nations !

It is he by whose power the elements, the heavens, and the light have been drawn out of nothing ; who has separated the earth from the surrounding waters ; his hand formed the sea, and that innumerable host of creatures which live on his bounty.

It is He who has given heat and light to the sun ; who has regulated the phases of the moon ; who has taught the planets their course ; who blazes in the lightning, and who speaks in the thunder !

He is heard in the roaring of the tempest. The strength of the lion, and the organization of the insect, are monuments of his power ; and to please men, he has taught the nightingale to form her melodious notes.

He gives to flowers their balsamic odours ; he weighs the air, and puts it in motion ; he calls forth the winds, and directs them in their course. The sea, which roars at the word of his power, obeys, and stands still at his threatening. God reigns in the depths of the abyss.

Being of beings ! How manifest is thy magnificence

in thy creatures ! Among them the traces of thy power are marvellous ! All creation proclaims thee—everything says unto me : “ Contemplate and magnify thy Maker.”

I hasten, O my Creator and Master, to bring thee my tribute of adoration and thanksgiving. Come, ye different creatures, unite with me to celebrate the Creator. Let us bow down before, and adore him. God, who has formed the universe, deserves our homage.

#### THE WONDERS WHICH GOD PERFORMS DAILY.

THE universe, which still subsists in all its beauty, and in that order in which it was first established, is a miracle which we have constantly before us. What an astonishing world is this which we inhabit ! How great the number, the magnificence, the variety, and the beauty of the creatures it contains ! What other hand than that of the Omnipotent could have placed in this immense expanse the sun and stars, whose magnitude, and prodigious distance from us, astonish the imagination ! Who has assigned them the path they have walked in for so many thousands of years ? Who has calculated so exactly the respective powers of all these globes ; and who has established so perfect a balance between them and the ether which supports them ? Who has placed the earth at such a due distance from the sun, that it is neither too near nor too far off ? The vicissitudes of day and night, the revolutions of the seasons, the innumerable multitude of animals, reptiles, trees and plants, which the earth produces, are all the work of God. If a world so admirable were now created before our eyes, who would not consider it as one of the greatest miracles of the Divine omnipotence ?

The particular providence of God is a continual proof of his greatness, power, wisdom, and omnipresence. The continual care which God takes of men, and his marked attention to each, of which every person has the most particular proofs ; the various methods he uses to bring men to himself ; the paths by which he leads them to happiness ; the adversities he makes use of to awaken and bring them to the knowledge of themselves ; the



extraordinary events which he improves to the advantage of his government ; events which are generally produced by trivial causes, and in circumstances which seem to render them impossible ; the great changes which he operates to spread the knowledge of his gospel from one country to another ;—these are so many effects in which we ought to acknowledge the ever active hand of God, and cry out with the Psalmist, “ This is the Lord’s doing ; and it is marvellous in our eyes.”

Let us only be attentive to what passes before us, and we shall find God everywhere ; we shall see that in all the ordinary means of grace he is incessantly labouring for our salvation ; that his word dwells among us ; and we may constantly hear his saving voice. Surely, those who refuse to hear him, and resist the motions of his Spirit, who yield not to his merciful operations, would not turn though new miracles were wrought before their eyes. Man, who considers that God has created this world, which everywhere presents so many wonders to him ; man, who is every moment loaded with the blessings of the Lord, and who has received from him all the comforts he enjoys ; ought he not to believe in, love, and obey him ? Yet he resists. What can affect him ? Whom will he not oppose ?

We, who are daily witnesses of the wonders of our God, should be attentive to them ; and not shut our hearts against the truth. Let not prejudice and passion prevent us from meditating on the wonderful works of God. Let us contemplate this visible world, and reflect on ourselves, and we shall find constant reason to acknowledge him, who works so many miracles every day before our eyes. Occupied with these great ideas, and struck with astonishment and admiration, we shall then cry out, “ Praise, honour, and glory be ascribed unto God, the Supreme Good, and the Redeemer of our souls ! To that God who alone works wonders ; to that God who fills the hearts of his people with the sweetest consolations ; to him who assuages our pains, comforts us in our afflictions, and who wipes away all tears from our eyes ; to him be glory for ever and ever !” Amen.

## SEPTEMBER XX.

## DIGESTION.

DIGESTION is a wonderful and complex business, which we perform daily without knowing how, and without even giving ourselves the least trouble to understand what is most remarkable and essential in so important a function of the human body. Millions take their food daily without ever having thought, even once in their life, what becomes of it after it has been swallowed. It is well for us that digestion may be carried on without our perceiving how it is effected; but is it not desirable to have some idea of the operations of nature in this respect?

After the food is chewed, divided into very small parts by the teeth, and moistened, it is prepared to pass into the œsophagus or gullet. This is the last function relative to digestion in which our wills have any part, for all the rest is performed without our knowledge; nor could we prevent it, if we even wished to do so. As soon as a bit is brought into the œsophagus, it thrusts it forward by a mechanism peculiar to itself, and forces it into the stomach, whither its own gravity could not carry it. When the food is brought into the stomach, it is there reduced, by some peculiar means, into a soft paste, of a greyish colour; which, after being sufficiently attenuated, passes into the first intestine, which is called the duodenum. In this the alimentary mass undergoes new changes. Several small vessels, which proceed from the gall-bladder, and from a gland situated behind the bottom of the stomach called the pancreas, open into the duodenum, and pour the bile and pancreatic juice into it, which are there mixed with the food.

Besides these, there are a multitude of glands in the intestines, which diffuse their humours through every part of the alimentary mass. It is after this mixture that the true chyle is discovered among this mass; and there is much reason to believe that digestion is completed and perfected in the duodenum.

The alimentary mass continues its course through the other intestines, where it is continually moistened by the juices which are secreted in their cavities. The chyle begins then to pass into the lacteal vessels, which open everywhere through the intestines, and terminate in the receptacle of the chyle. This is situated in that part of the back where the first and second lumbar vertebræ commence; from it the thoracic duct proceeds, which runs along the spina dorsi, and opens into the back side of the left subclavian vein, near the outside of the internal jugular. The chyle flows through this canal; and in order to mix with the blood, it is received into the heart, and dispersed by the arteries and veins all over the body, losing its white or greyish colour in this circulation.

But there are always some parts of the food which are too gross to be converted into chyle, or to enter into the lacteal vessels. What becomes of these? The intestines have a peristaltic or vermicular motion, by means of which they alternately contract and dilate, and thus push downward the matter they contain. This motion having caused the alimentary mass to pass into the third intestine, protrudes the residuum through the fourth, fifth, and sixth successively. This substance, which may be considered as the husks of the aliments, having arrived at the end of the rectum, or last large intestine, would be slowly and continually evacuated, which would be a terrible inconvenience, had not nature encompassed the mouth of this bowel with a muscle, called the sphincter, which contracts and keeps it shut. Thus the residuum of each digestion is accumulated in the rectum, and there continues till the quantity, and the irritation which it occasions, indicate the necessity of parting with the whole. Then the muscles of the abdomen and diaphragm, assisting the action of the rectum, surmount the resistance of the sphincter, and the superfluous matter is expelled.

This is a slight sketch of the manner in which digestion is performed in our body; digestion, so essential to our health, our comfort, and even our very existence. Let us consider how evidently the wisdom of God appears in all this. What wonderful circumstances must

concur in order to accomplish this end! The stomach must not only have an inward heat and a dissolving fluid, but also a peristaltic motion, by which the food is attenuated, and reduced into a soft paste, and afterwards converted into chyle; which, being distributed through all the members of the body, supplies them with blood and nourishment. The saliva, or spittle, is also necessary, which has the property of soap, and the virtue of mixing together oily and aqueous matters. There must be also, through the whole course of the intestines, certain machines which separate the various necessary humours from the blood, that the aliments may be sufficiently elaborated, and the chyle brought to perfection. The tongue, the muscles of the cheek, the teeth, and other organs beside, must all concur to divide, grind, and attenuate the aliments before they descend into the stomach. How much wisdom is discovered in this! How inexcusable should we be, were we inattentive to these wonders, and not excited by them to glorify our Creator!

## SEPTEMBER XXI.

### THE PREVALENCE OF GOOD OVER EVIL IN THIS WORLD.

NOTHING is better calculated to comfort us, in the afflictions and trials which we meet with in this life, than admitting as a fixed principle, that there is more good than evil in the world. Let us consult the most wretched man, and ask him if he can reckon up as many causes of complaint as he has motives for gratitude? He would soon find, that however great his afflictions may be, they are not equal to the multitude of mercies which he has received in the course of his life.

To render this truth still more evident, let us reckon how many days we have enjoyed health, and how very few we have been sick. To the few troubles and disappointments which we have met with in civil and domestic life, let us oppose the many comforts they have afforded us. Compare all the good and innocent actions

by which the greater part of men render themselves useful, either to themselves or to their fellows, with the small number of those which may be termed injurious. Let us reckon, if possible, all the agreeable sensations which each sense affords us. Let us number all the pleasures which belong to every age, state, and profession; all the gifts which nature bestows in such abundance, and which human industry knows how to use, so as to procure an infinity of pleasures and conveniences. Let us reckon the pleasure we felt when we escaped or surmounted any danger; when we gained any victory over ourselves, or did some wise or virtuous action. Let us reckon all these blessings, the enjoyment of which we can recollect, and consider how few of our past mercies we can remember. Let us also consider, that it is only the habit of receiving good which renders us at all sensible of evil; that new blessings cause us to forget those that are past; and that if the evils we meet with make so deep an impression upon our minds, it is precisely because they occur seldom, and we are not accustomed to them.

Let us reckon the happy occurrences which we may remember, and which, by the way, make but the smallest part of the whole good we have enjoyed, and let us oppose them to the evils we remember, the great utility of which we do not yet know. I do not say all the evils we may remember, for I do not speak of those which, according to our own confession, have enhanced our blessings, and have been the source of many and great advantages. I do not speak of those little evils which are preservatives from greater ones, and which are dispensed to men to make them better and happier, or to instruct others by their example; for evils of this kind are compensated by their advantageous consequences to mankind. In the calculation I wish to make, we must only oppose, to the blessings which we recollect, those evils the usefulness of which we do not yet know; and I aver, that if we make this computation in moments of coolness and serenity, and not in the time of disappointment, vexation, or affliction, we shall be fully convinced that the blessings we enjoy in this world vastly overbalance all the evils we meet with.

Why, then, do men think so little of the continual proofs which they receive of the goodness of God? Why do they love to dwell on the gloomy side of things, and torment themselves with unreasonable cares and inquietudes? Does not Divine Providence surround us with pleasing objects? Why, then, fix our eyes continually on our infirmities, on what we want, and on evils which may possibly happen? Why magnify them in our imagination, and obstinately turn away our eyes from what might make us easy and cheerful? But thus it is; the least affliction we meet with arrests our whole attention, whilst a long series of happy days slips away without being noticed. We draw distresses and vexations on ourselves, which could never take place were we more attentive to God's blessings. Let us abandon a line of conduct so well calculated to make us wretched. Let us be fully assured, that God has dispensed his blessings over the earth with an impartial hand; that there is no man upon earth that has any real cause of complaint, but, on the contrary, the most numerous reasons for songs of gratitude, thanksgiving, and praise.

"Blessed be that God who is our sovereign good! He fills our hearts with joy and gladness. If he try us sometimes by afflictions, his consolations soon cheer our souls, and his goodness condescends to promise us a happiness unclouded and without end. He leads us by secret and unknown paths to the infinite blessings he designs us. Even the trials which he now and then sends are intended to accomplish the most beneficent ends, which we shall one day gratefully acknowledge. In the mean time, he permits us not to be tried above our strength; his powerful and paternal hand still protects us, and the eye of his mercy is ever open upon us.

## SEPTEMBER XXII.

## ENMITY AMONG ANIMALS.

THERE is a constant enmity between animals; they attack and pursue each other continually. Every element is to them a field of battle: the eagle is the terror of the inhabitants of the air; the tiger lives by carnage on the earth; the pike, in the waters; and the mole, under the earth. It is the want of food which induces these and other animals to destroy one another. But there is an antipathy between certain creatures which does not proceed from the same cause. It is manifest, for example, that the animals which twist themselves about the elephant's trunk, and never give over till they have stifled him, do not do it in order to procure themselves food. When the ermine leaps up, and fixes itself in the ear of the deer or elk, and bites them with its sharp teeth, it cannot be said that these hostilities have been occasioned by hunger. But there is not an animal on the earth, how small soever it may be, that does not serve for food to some other animal.

I know well, that there are some persons to whom this arrangement of nature appears cruel and improper; but I do not hesitate to assert, that even this antipathy, and the enmity which exists among animals, furnish an excellent proof that all is well ordered. Take animals in the gross, and it is certainly an advantage that some should prey on others; for, on one hand, a number of species could not exist without this, and, on the other, those numerous species, far from being injurious, are useful to the others. Insects and many reptiles feed on carrion. Others fix their abode in the bodies of certain animals, and feed on their flesh and blood; and those same insects are food for other creatures. Carnivorous animals and birds of prey kill and feed on other animals. Some kinds multiply so prodigiously, that they would become oppressive were not this increase interrupted. Were there no sparrows to devour these insects, what would become of flowers and fruits? Without the

ichneumon, which seeks and devours the crocodile's eggs, this formidable animal would multiply to an alarming degree.

A great part of the earth would be desert, and many species of creatures could not exist, were there no carnivorous animals. Perhaps it might be said that they would feed on vegetables; but were this the case, our fields could scarcely produce herbage enough for sparrows and swallows. Besides, the structure of the bodies of carnivorous animals must be different from what it is now; and how could fish, for instance, find subsistence, were they not to live on the inhabitants of the waters? There is reason, also, to suppose that animals would lose a great deal of their vivacity and industry, were it not for the continual wars among them. The creation would be less animated, beasts would become stupid, and man himself lose a great part of that activity which is now employed against the incursions of destructive animals. Finally, many striking proofs of the wisdom of God would be wanting, were there a universal peace among animals; for the cunning, sagacity, and wonderful instinct with which they lay snares for and surprise their prey sufficiently point out the wisdom of the Creator.

So far, then, is the enmity among animals from casting a shade over the wisdom and goodness of God, that these perfections shine with new lustre from this very circumstance. It seems to have entered into the plan of creation, that certain animals should feed upon others. We might, indeed, complain of this plan, if the entire destruction of any species should be the result; but this never happens; and the constant wars among animals are, on the contrary, the real cause of preserving a perfect balance. Thus carnivorous animals are the indispensable connecting links in the chain of beings; and on this very account their number is small, compared with that of useful animals.

It is further worth remarking, that the strongest and most savage animals have commonly less understanding and cunning than the others; they either destroy each other reciprocally, or their young become food for other beasts. Hence it is that nature has endowed the weakest



animals with so much industry, and so many means of defence. They have that instinct, delicacy of sense, swiftness, address, and cunning necessary to counter-balance the strength of their enemies. Is there any who cannot behold in this the infinite wisdom of the Creator? Or who will not acknowledge that the state of warfare among animals, which at first sight appears so strange, is nevertheless a real good? We should be still more convinced of this, could we take in the whole system of things, and the relations and connexions which the different creatures have with each other.

But this degree of knowledge is reserved for the other world, where the Divine perfections shall be manifested to us in their infinite splendour. Yet even in this world we may be able, in some sort, to comprehend why this hostility among animals is necessary. But it is absolutely incomprehensible, why divisions and destructive wars should reign among men, the most noble of all creatures. Alas, it must be confessed, to the scandal of humanity, that men are found who even dare to profess the Christian religion, while more ferocious and destructive than the most savage beasts: their hostilities are more multiplied, and they make use of means the most dexterous and secret to destroy each other. Lions, tigers, and vultures are lambs and doves when compared to man. Nothing can be more foreign to the merciful design of God than this. His intention was, that each man should render himself useful to his fellow-creatures, and contribute as much as possible to their comfort and happiness; that he should be their defender, benefactor, guardian, and God: in a word, that every man should render to another all the good offices within the limits of his power. Let none of us counteract these merciful designs of the Lord, but let us endeavour to live below in peace and concord. Let animals destitute of reason persecute, hate, and destroy one another; but let us follow the example of Jesus Christ, and endeavour to render each other happy.

## SEPTEMBER XXIII.

## THE MORAL USES OF THE NIGHT.

THE days begin to shorten, and the nights grow long ; and many people are discontented with this arrangement of nature. They perhaps secretly wish that there were no night ; or at least, that the nights were all the year round as short as they are in June and July. But such wishes are unreasonable, and betray our own ignorance. If we would take the trouble to reflect on the advantages which result from the vicissitudes of day and night, we should not be so precipitate in our judgments, nor make such groundless complaints ; but rather acknowledge the usefulness of the plan, and bless God for it.

First, what is well calculated to make us perceive the moral utility of the night is this, that it interrupts the progress of most vices ; or at least of those which are most injurious to society. Darkness obliges the wicked man to take rest, and procures some hours of relief to oppressed virtue. The unjust or fraudulent merchant ceases during the night to cheat his neighbour ; and when darkness arrives, a thousand disorders are arrested. Were men to be twice as long awake as they are at present, to what a frightful degree would evil actions of every kind be multiplied ? The wicked, by giving themselves up uninterruptedly to vice, would acquire a horrible facility of sinning. In a word, we may assert that the longer the nights are, the fewer crimes are committed in the space of the twenty-four hours ; and this is certainly not one of the least advantages which we derive from the night.

Of how much instruction and mental pleasure should we be deprived were there no night ! The wonders of creation which the starry heavens present, would be lost to us. But as each night shows us the magnificence of God in the stars, we may raise up our hearts to him, and feel more sensibly our own littleness. If every occurrence which reminds us of God should be precious to us, how ought we to love the night, which proclaims

to us in so energetic a manner the perfections of God ! Did we pay proper attention to this subject, no night would appear too long ; each would be beneficial to us ; and one spent in meditating on the works of God might have the happiest influence over our future life. Let us therefore contemplate attentively that immense theatre of the wonders of God, which the night discovers to us. A single good thought which this grand sight may occasion ; a thought with which we may go to sleep, and with which we may awake ; with which we may entertain ourselves during the course of the day, may be of the utmost utility to our understanding and to our heart.

In general night is a very advantageous time for those who love to meditate, and to use self-examination. The tumult and dissipation, in which we commonly live during the day, leave us but too little time for recollection, for detaching our affections from the earth, and for occupying ourselves seriously about our latter end, and the duties of our station. The tranquillity of the night invites us to and assists us in these serious occupations. We may then, without interruption, converse with our hearts, and acquire the important science of self-knowledge. Our souls may collect all their powers, and direct them to the objects which relate to our eternal happiness. We may then banish the evil impressions which we received from the world, and get our souls fortified against the seducing examples of the age. This is the time in which we may meditate on death without distraction, and employ ourselves in the great concerns of the eternal world. The tranquil solitude of our closets is favourable to religious thoughts, and will inspire us with an ardent desire, to be more and more occupied in this sacred work.

Let all the nights with which God may bless us, be sanctified by these salutary meditations. Then, far from murmuring at the vicissitudes of night and day, we shall praise God for them, and bless the night in which we have learned to know our own wretchedness better, the glory of the Lord, and the things which pertain to our eternal peace.

## SEPTEMBER XXIV

THE CAUSES OF MEN'S INDIFFERENCE ABOUT THE WORKS  
OF NATURE.

WHENCE is it that men are so indifferent about the works of God in nature? An answer to this question may give rise to various important reflections.

The first cause of this indifference is inattention. We are so accustomed to the beauties of nature that we neglect to admire that wisdom, the impress of which they bear; and are not as grateful as we ought to be for the innumerable advantages which we derive from them. There are too many people who resemble the stupid beast who feeds on the herbs of the field, and quenches his thirst at the stream, without ever reflecting whence these blessings which he enjoys proceed; and without acknowledging the goodness and wisdom of Him who bestows them. Thus, men, though endowed with the most excellent faculties, by which they are enabled to participate more of the blessings of nature, seldom think of the source whence they flow. And even where the wisdom and goodness of God are the most strikingly manifest, they are little affected, because they are so accustomed to the displays of his power; habit renders them indifferent and insensible, instead of exciting their admiration and gratitude.

A second cause of this indifference in many people is ignorance. How many are there who are wholly unacquainted with the most common phenomena of nature? They see the sun rising and setting every day: their fields are moistened sometimes with rain and dew, and sometimes with snow. The most wonderful revolutions take place under their notice every spring, but they give themselves no trouble to inquire into the causes and purposes of these phenomena, in respect to which they live in the most profound ignorance. It is true, there are a thousand things which will ever be incomprehensible to us, however diligently we may study; nor are we more sensible of the limited state of our knowledge, than

when we endeavour to fathom the operations of nature. But we may at least acquire historical knowledge of them ; and the meanest labourer may comprehend how it comes to pass that the seed which he sows in the ground buds and springs up, if he will take but a little trouble to inform himself on the subject.

Thirdly, others disdain nature's operations, because they are wholly employed in their private interests. I am satisfied these would be more attentive observers of nature, if, for instance, spiders spun threads of gold ; if lobsters contained pearls, and if the daisy possessed the virtue of restoring old men to youth. In general, we value things only according to interest or fancy. The objects which do not immediately and sensibly gratify our inordinate desires, we judge unworthy our attention. Our self-love is so unreasonable, and we know so little of our true interests, that we despise the things which are of the greatest use. Corn, for instance, is of all other plants the most indispensably necessary to our subsistence ; and, nevertheless, we see whole fields covered with this very useful production of nature, without paying proper attention to it.

Fourthly, many neglect the contemplation of nature through indolence : they are too fond of ease to take a few hours from their sleep to contemplate the starry heavens : they cannot persuade themselves to rise early in order to see the rising sun ; they dread the fatigue of stooping to the ground to observe the admirable art which appears in the formation of the grass. And yet these very people, who are so fond of their ease and comfort, are full of ardour and activity when the gratification of their passions is the object. It would be a kind of martyrdom to the intemperate man, and to the gamester, to be obliged to consecrate those hours which they spend in drunkenness and gaming, to the contemplation of a beautiful starry sky. A man who loves walking, and would go many miles on foot to see a friend, would take it very ill to be obliged to go two miles to observe some singularity of nature.

Fifthly, Others neglect the works of God in nature through a principle of irreligion. They do not wish to know the greatness of God. They have no taste for

piety, nor for the duties it prescribes. To praise and love God, to be grateful to him for the benefits he has conferred on them, would be to them disagreeable and painful duties. We have too much reason to believe that this is one of the principal causes of that indifference which many have for the works of God. If they valued the knowledge of God above all things, they would eagerly embrace every opportunity of establishing themselves in that knowledge, and of perfecting their love to their Creator.

Two-thirds, probably, of mankind may be ranked in the different classes which we have already pointed out. At least, it is certain that there are very few who study the works of God in a proper manner, and delight in them. This is a melancholy truth, the proof of which is daily exhibited. Would to God that we could at last be convinced how ill it becomes men to be thus insensible of and inattentive to the works of the Creator; and how by this conduct they degrade and debase themselves below the very brutes! What! have we eyes, and shall we not contemplate the beauties which everywhere surround us? Have we ears, and shall we not listen to the hymns which every part of the creation sings to the praise of the Lord? We wish to see him in the kingdom of his glory; and shall we refuse to contemplate him here below in his admirable works? Let us renounce an indifference so criminal, and endeavour henceforth to feel something of that joy which David felt as often as he reflected on the works, the magnificence, and the glory of his Creator!

## SEPTEMBER XXV

### ON SEVERAL NOCTURNAL METEORS.

WHEN the sky is pretty clear, we often observe a circular light, or large luminous ring, round the moon, which is called a halo or crown. Its outline has often the faint colours of the rainbow. The moon is in the centre of this ring, and the intermediate space is generally darker than the rest of the sky. When the moon

is at the full, and high above the horizon, the ring appears most luminous. It is often of a considerable size. We must not imagine that this circle is really round the moon; we must seek the reason of it in our own atmosphere, the vapours of which cause a refraction of the rays of light which penetrate them, properly adapted to produce this effect.

There appear sometimes, around or on one side of the real moon, some false ones, which are called paraselenes, or mock moons. These are apparently of the same size of the moon; but their light is paler. They are generally accompanied with circles, some of which are coloured like the rainbow, others are white, and several have long luminous tails. All these phenomena are only illusions produced by refraction. The light of the moon falling on aqueous and sometimes frozen vapours, is refracted in various ways; the separated rays appear coloured, and, reaching the eye of the spectator, double the image of the moon. Sometimes, but such appearances are very rare, we see in moonlight, after a heavy fall of rain, a lunar rainbow, which has exactly the same colours of the solar rainbow, only fainter. This is also occasioned by the refraction of the rays of light.

When sulphureous and other vapours take fire in the higher atmosphere, we often observe streaks of light dart swiftly like rockets. When these vapours collect in a mass, take fire, and fall down, we think we see little balls of fire falling from the sky; and as, from their distance, they appear about the size of stars, they are on this account called falling stars. The common people think they are real stars, which change their places, or are dissipated, or purified. Sometimes these imaginary stars are very brilliant, and magnificently coloured; descend slowly, always acquiring new lustre, till at last they are extinguished in the vapours of the lower atmosphere, and falling on the earth, leave, as is supposed, a gluey, viscous substance behind them. Great globes of fire have sometimes been seen more luminous than the full moon, with long tails. They are probably sulphureous and nitrous vapours, which accumulate and take fire; for they traverse the atmosphere with great velocity, and afterwards burst with a loud noise. Some-

times, when the inflammable particles of which they are composed are of a different nature, they disperse without noise in the higher regions of the atmosphere.

The little flashes, which we see so often in the summer evenings after intense heat, are produced by vapours in the atmosphere, which are less visible because they are higher up. This meteor is distinguished from real lightning by its never being accompanied with thunder. It is probable, however, that these flashes are the reflection of lightning, which is at too great a distance for us to hear the peal of thunder with which it is accompanied. For a flash at the height of a mile may be seen at the distance of more than one hundred miles, and its reflection further still, though the thunder can scarcely be heard further off than ten or twelve miles.

The flying dragon, the dancing goat, the burning beam, and various other meteors, owe their odd names to their singular appearance. They are only gross and viscous exhalations, which ferment in the humid regions of the lower air; and which, being pressed in different directions by the agitated atmosphere, assume different forms, to which the common people give those extraordinary names. Several naturalists have imitated these in miniature, by mixing certain inflammable substances together.

Of all the nocturnal phenomena, none is more remarkable, or on the whole more brilliant, than the Aurora Borealis, or northern lights; they are seen generally from the beginning of autumn till the commencement of spring, when the weather is clear and serene, and the moon does not give too much light.

The Aurora Borealis has not always the same appearance. It is usually towards midnight that a brightness, similar to the dawn of day, begins to appear. Sometimes we observe streaks, and sudden jets of light, with white and luminous clouds in perpetual motion. But when this meteor is to be exhibited in all its perfection, we generally see, if the weather be calm and clear, towards the north, a thick and dark cloud, the upper part of which is edged with a white and luminous border, which emits rays, brilliant jets, and resplendent pillars; which, arising from moment to moment, grow



yellow and red ; afterwards meet, unite, and form a thick and luminous cloud ; and finally terminate in variously coloured clouds, white, blue, fiery red, and the most beautiful purple ; whence rays of light are continually shooting out. At such a time. the Aurora Borealis is in all its pomp and splendour.

How great is the magnificence of God ! Even the night itself proclaims his majesty. How can we complain that at this season the nights are gradually increasing in length, seeing they present us with such magnificent sights, as interest both our minds and hearts ? The phenomena of which we have spoken render the long nights of the inhabitants of the northern nations not only supportable, but even brilliant and pleasing.

Our nights, which are much shorter, might, nevertheless, afford us diversified pleasures, would we pay a proper attention to such phenomena. May we accustom ourselves to raise not only our eyes but our hearts to heaven ! May we soar beyond moons and stars to thee our Creator ; that we may reflect on thy majesty, and silently adore thee when our eye is struck with the magnificent spectacle of the night ! “For thou, O Lord, art great : the silence of the night loudly proclaims thy power and love. The moon in azure plains announces thy majesty ! The host of stars which burn in the firmament celebrate and praise thee ! The mild light of the Aurora Borealis, which we see above our heads, discovers the perfections of our God !

## SEPTEMBER XXVI.

### THE FORMATION OF THE CHILD IN ITS MOTHER'S WOMB.

THIS seems to be one of the most impenetrable mysteries in nature. For several centuries the most eminent naturalists have neglected nothing to find out how the generation of man is effected ; but even to the present time, we have nothing on the subject but conjectures. The following seem to be nearest the truth.

The seminal liquor is properly what fecundates the

egg in the mother's womb; the matrix or womb itself is the place in which this fecundation takes place. This liquor is included in the seminal vessels, and by the assistance of a microscope we can discover long and regular bodies, which seem to be divided into an infinity of little globes. On each side the matrix there is a substance of an oval form, which is supposed to be the ovaries; and in which certain round vessels are found, full of clear lymph. When the most spirituous parts of the seminal liquor have penetrated the ovaries, fecundation takes place. The impregnated egg then detaches itself from the ovaries, falls into the matrix, and remains there till all is matured. Possibly the embryo may exist in miniature in the egg before impregnation, and the seminal liquor may answer no other end than merely to stir up, animate, and put the principle of motion into play, and so dispose it to unfold itself by means of the warmth.

However the business of conception may be effected, it is a fact, that shortly after impregnation the growth of the foetus becomes sensible. Three days after, a small bladder of, an oval form is found in the matrix; the membrane of which it is formed is extremely fine, and it is filled with a limpid fluid, very nearly resembling the white of an egg. In this, some small connected fibres may be seen, which are the first rudiments of the foetus. Seven days after, a little oblong mass may be seen; from the centre of which some fibres proceed, which are the first rudiments of the umbilical cord. Fifteen days after conception, the nose appears like a little prominent thread, the mouth like a line, the eyes like two black points, and the ears like two small holes: the arms and legs also begin to appear, like small protuberances. At the end of twenty-one days, the arms and legs are easily distinguished, the ribs, fingers, and toes appear like little threads. In one month the foetus is an inch long, and lies in a crooked posture in the surrounding fluid, and the human form is very perceptible. The toes and the fingers are distinct from each other; the skin is extremely fine and transparent; the viscera are like fine threads; the bones still soft; the vessels which are to form the umbilical cord are as yet in a

straight line, alongside of each other. The placenta occupies no more than the third of the whole mass, whereas at the first it occupied one half; but it has now increased much in thickness and solidity. The whole mass is still of an oval form, being in its longest diameter an inch and half, and in its shortest an inch and a quarter: the two little skins become more and more apparent. In six weeks the human form becomes perfect; only the head is longer than the proportion it should bear to the rest of the body. About this time the heart may be seen to move; and at this stage it has been known to beat a considerable time after it had been separated from the mother's womb. In two months the foetus is two inches long; the ossification is evident in the legs and arms, and in the point of the lower jaw, which at this time projects much beyond the upper one; the umbilical cord also about this time begins to turn and twist. Three months after conception, the foetus is nearly three inches long; and is from six to seven, in four months and a half. Then the nails appear. If it be a male, the testicles may be seen inclosed in the belly below the reins. The stomach is filled with a certain thickish fluid, something like that in which the embryo floats; the small bowels contain a milky substance, and the large ones a black liquid matter. There is now a little bile in the gall-bladder, and a little urine in the bladder. The head is bent forward, the chin rests upon the breast; the knees are drawn up, and sometimes almost touch the cheeks; the legs lie close to the thighs; one of the hands touches the face, and sometimes both; at other times the hands hang down along the sides. From this time the growth of the foetus goes on rapidly and without interruption, till at the ninth month it abandons its prison, and emerges into day.

Behold an epitome of the history of the formation of a child in the womb! What a number of things are included in it, which may well fill us with astonishment, and cause us to admire the power and wisdom of God! The whole process, from the moment of our conception to that of our birth, is a series of wonders; and there may be many others which have escaped our notice, and which we cannot discover. Let this assemblage of won-

ders excite us to adore that God who has formed us. Let us look back only through a few years, and we find we had no existence! And how is it that we came out of nothing? We have not created ourselves; that Infinite Being who created the world has given us our existence: and why has he brought us into being? Is it not that we might live in such a manner as becomes the dignity of an intelligent creature, created and redeemed for eternal happiness?

## SEPTEMBER XXVII.

## OF AMPHIBIOUS ANIMALS.

BESIDES quadrupeds, fishes, and birds, there is also a species of animals which can live either on the earth or in the water, and on this account are termed amphibious. They are all cold-blooded, have something gloomy and disgusting in every part of their form; of a dull and disagreeable colour; a bad smell, a hoarse voice; and many of them are very venomous. Instead of bones, these animals have cartilages. The skins of some are smooth, and those of others covered with scales. Most of them hide themselves in dirty infected places. Some are viviparous, others are oviparous. The former do not hatch their eggs, but leave them to the warmth of the air, or that of the water. Sometimes they even lay them on dunghills. Almost all creatures of this species live by prey, which they procure either by strength or subtlety. In general they can bear hunger a long time, and live a laborious life. Some walk, others creep; and this divides them into two classes.

The first class consists of those which have feet. The tortoise, which belongs to this class, is covered with a kind of shell resembling a buckler. Land tortoises are the smallest. Those that live in the sea are five ells in length, and from eight to nine hundred pounds weight.

There are different kinds of lizards; some have a smooth skin, others are covered with scales. There are some which have wings, some without. Those with wings are called dragons. Among those which have no

wings are reckoned the crocodile; the camoleon, which can live six months without food; the salamander, which has the property of living some time in the fire without being consumed, because the cold slimy fluid, which it throws out in all directions, extinguishes the coals. The crocodile is the most formidable of all this class. This animal comes out of an egg which is about the size of that of a goose; and grows to such a prodigious size, that it is from twenty to thirty feet long. It is voracious, cruel, and cunning.

Serpents constitute the second class of amphibious animals. They have no feet; but creep by a winding vermicular motion, by means of the scales and rings with which their bodies are covered. The vertebræ of their backs have a peculiar construction, which favours this sort of motion. Many of these serpents have the property of attracting birds and other small animals, on which they prey: seized with terror at the sight of the serpent, and perhaps rendered giddy with its venomous exhalations, these birds have no power to fly away, but fall into the gaping mouth of their enemy.

As the jaws of serpents may be greatly extended, they sometimes swallow animals whose bodies are larger than their own heads. Several serpents have fangs in their mouths very like their other teeth. These are a species of darts, which they let out and in as they please, and by this means they eject into the wound which they make, a poisonous humour, which comes from a little bag placed at the root of the tooth. This poison has the singular property of being injurious only to wounds; for it may be taken internally without any danger! The serpents provided with arms, which have been just mentioned, are but about the tenth part of the whole species; none of the rest are venomous, though they will dart at men and animals with as much fury as though they could kill them. The rattlesnake is the most dangerous of all. It is ordinarily from three to four feet long, and as thick as the thigh of a full-grown man. Its smell is strong and very unpleasant: it seems as if nature had designed this, as well as its rattles, to warn men of its approach, that they might have time to escape. This reptile is most furious when it rains, or when it is tor-

mented with hunger. It never bites till it has coiled itself into a circle; but the quickness with which it assumes this form is incredible. To coil itself up, to prop itself upon its tail, to dart upon its prey, to wound and retire, are but the work of a moment.

Some probably may say, Why has God created such animals, which seem only to exist for the torment and destruction of man? This question, and many others like it, show that we only think of ourselves; that we form rash judgments, and are prone to find fault with the works of God. Considered in this point of view, these questions are highly unbecoming and culpable. But if such questions be asked, in order to get a deeper conviction of the wisdom and goodness of God in the works of creation, they are not only proper in themselves, but highly necessary to those who wish to know the reason why God has formed so many noxious creatures? To those then who are well disposed, and who seek information, I address myself. Perhaps it may appear to you that such creatures as lizards and serpents were not created for the general good of the world. This judgment is rash; for if, among amphibious animals, some are formed which do much mischief, it is certain that most of them are quite harmless. And is it not a proof of the goodness of God that only the tenth part of serpents is venomous? Besides, even those which are mischievous have their bodies so formed that it is generally easy to escape them. How formidable soever (for instance) the rattlesnake may be, it cannot conceal its approach; its rattles give us timely warning to provide for our safety. It is also worthy of notice, that Providence has opposed to every reptile an enemy that can conquer it. The sea-hog everywhere seeks the rattlesnake that he may devour it: besides, a child is strong enough to kill the most terrible of them; for a slight blow with a stick across their back is almost immediate death to them. Further, it would be very unjust to dwell so much on the mischief which these animals may do us, without considering the good which they actually do. Some amphibious animals are useful for food, others for medicine; and the shell of the tortoise is of very great service. In a word, the Divine wisdom is as con-

spicuous here as in all other things. To reflect on these perfections of the Lord, to admire and adore them, is a duty we should perform, when we behold creatures which appear to be injurious; but it is always unbecoming in us either to condemn or murmur against his plans. And this would be still more culpable, as our understandings are too limited to comprehend the various uses for which such creatures may be designed.

## SEPTEMBER XXVIII.

### THE PERFECTION OF THE WORKS OF GOD.

WHAT can equal the perfection of the works of God? and who can describe the infinite power which is manifested in them? It is not enough that their magnitude, number, and variety fill us with admiration; for each particular work is formed with such infinite skill, each is so perfect in its kind, that the exactness and regularity of his smallest productions announce the unlimited grandeur and wisdom of their author. We are with reason astonished at the different arts which the moderns have invented; by means of which they accomplish things which would have appeared supernatural to our ancestors. We measure the height, breadth, and depth of bodies; we know the orbits of the planets, and can direct the course of rivers; we can raise or depress waters; construct moveable buildings on the sea; and we accomplish a number of other works which are an honour to the human understanding. But, what are all the inventions of men, their most magnificent and beautiful works, in comparison of the least of the works of God! How weak, how imperfect the imitations! How far is the original above copy! Let the most eminent artist employ all his power to give his work a pleasing and useful form; let him smooth, perfect, and polish with all possible care; and after all his labour, all his diligence, all his efforts, let him view this masterpiece through a microscope, and see how coarse, ill-shaped, and rough it will appear! How great a want of regularity and proportion he will discover in it! But whether we ex-

amine the works of the Almighty with the naked eye, or through a microscope, we shall always find them equally admirable and beautiful. Perhaps through the microscope they may appear very different from what they seemed to the naked eye; but we shall ever see the most exquisite figures, together with incomparable proportion, order, and harmony.

The divine wisdom has formed and arranged all the parts of each body with infinite skill, according to number, weight, and measure. Such is the prerogative of a power which is unlimited, that all its works are regular and perfectly proportioned. Admirable order reigns through the whole of his works, from the least to the greatest. All is in perfect harmony, all is well connected, so that we find no breaks; no link is wanting in the immense chain of created beings; nothing is misshapen; every part is necessary to the perfection of the whole; and each part considered separately is as perfect as it ought to be. Can we describe the innumerable beauties, the varied charms, the pleasing mixture of colours and hues, with all the ornaments so diversified, of the fields, plants, and flowers, vallies, mountains, and forests? Is there a single work of God but has its peculiar and distinct beauty? Is not that which is most useful at the same time the most beautiful? What an astonishing variety of forms, figures, and sizes do we see among inanimate creatures? But there is still a more abundant variety in animated nature; nevertheless, each is perfect, and nothing deficient, nothing exuberant is found in either. How great therefore must his power be, who, by a single act of his will, has caused all these creatures to exist!

But to admire the power of God we need not go back to that time when his omnific word called all things out of nothing, when everything was instantaneously brought forth, and yet in a state of perfection. Do we not each spring behold a new creation? What can be more wonderful than the revolutions which then take place? The vallies, fields, meadows, forests, all in some sort die at the end of autumn, and nature is spoiled of all her ornaments in the winter. All animals languish, the birds



hide themselves, and are silent ; all becomes desert, and nature appears benumbed and insensible. Nevertheless, a divine power acts in secret, and labours for the renewal of nature unobserved by us. Animation is restored to benumbed bodies, and everything is in expectation of a sort of resurrection.

How can we be spectators so often of this magnificent spectacle without admiring, with more profound veneration, the power and glory of the Most High ? How can we ever breathe the cool refreshing air without being led to such reflections ? Does not God manifest himself in nature as well as in revelation ? Should we ever rest under the shade of a tufted tree, should we ever see a field enamelled with flowers, a beautiful forest, or waving corn ; should we ever pluck a flower, or enter a garden, without remembering that it is God who has given the tree its foliage, the flowers their beauty and perfume, the woods and meadows their pleasing verdure ; that it is He “ who causes bread to spring out of the earth, wine that maketh glad the heart of man, and oil to make his face to shine ? ” Struck with admiration, and penetrated with gratitude and love, we should exclaim with the Psalmist, “ O Lord, how manifold are thy works ! In wisdom hast thou made them all ; the earth is full of thy goodness ! ” *Ps. civ. 14, 15, 24.*

## SEPTEMBER XXIX.

### FRUIT.

THIS is the blessed season in which the divine goodness pours out to us fruits of every kind in the richest abundance. “ The charms of summer give place to more solid enjoyments ; delicious fruits supply the absence of flowers. The golden pippin, whose beauty is increased by purple streaks, causes the branch which bears it to bend down. The mellow pear and the plumb, whose sweetness rivals honey itself, display their beauty, and seem to invite the hand of their Master. ” Should

we not be inexcusable, if at the sight of all these blessings, with which we are laden through the munificence of God, we did not endeavour to sanctify the pleasures of autumn by reflecting on the kindness of our Maker?

With what wisdom has the Creator distributed fruit through the different seasons of the year! It is in summer and autumn, principally, that nature has made us these rich presents; but by the assistance of art, we are also favoured with them both in winter and spring, and our tables may be furnished with certain kinds through the whole course of the year. From the beginning of June, nature herself, without the assistance of art, furnishes raspberries, gooseberries, and common cherries. The month of July furnishes our tables with cherries, peaches, apricots, and some kinds of pears. August seems rather to lavish than give its fruits; figs, late cherries, and a variety of excellent pears. September provides us some grapes, winter pears, and apples. The presents of October are different kinds of pears, apples, and the delicious fruit of the vine.

It is with this wise economy that nature measures out and distributes her gifts; on the one hand, that we may not be overloaded with too great an abundance; and on the other, that we may still have a successive variety of enjoyments. It is true that in proportion as we advance into the winter season the number of good fruit diminishes considerably; but art has taught us to preserve some even for this season. God has not thought proper to dispense with our labour in this business; he wills that we should be ever active, and that we should diligently labour to supply our own necessities. Hence it is that God has distributed his blessings with such variety, and has purposed that they should spoil, or be destroyed, if proper care be not taken to preserve them.

How abundantly has God distributed fruit to us! Notwithstanding the continual ravages of birds and insects, there still remains a sufficient quantity to compensate for this loss. Reckon only, if possible, the number of fruits which a hundred trees bear in one favourable year, and you will be astonished at the result, and admire

that prodigious multiplication which extends *ad infinitum*.

And what was the design of such abundance? If the propagation and preservation of trees were the only design, much less would, without doubt, have answered that end. It is therefore evident, that the Creator wished to provide for the nourishment of men, and in particular for the poor and necessitous. By giving them so much fruit, he has furnished them with a cheap mode of subsistence, both wholesome, nutritious, and pleasant; so that they have no reason to envy the rich their far-fetched dainties, so often injurious to health.

There is scarcely any thing more nourishing than fruit. It is through the benevolent attention of Providence that we have them in a season when they are not only pleasing refreshments to us, but excellent medicines. Apples come seasonably in the heats of summer, because they moderate the heat of the blood, and cool the stomach and intestines. Plums have a grateful acid, and an unctuous and emollient juice, which render them helpful in many cases. They purge gently, and correct the acrimony of the bile and other humours, which so often occasions inflammatory disorders. And if there be certain fruits the use of which is found to be unwholesome, as some think peaches, apricots, and melons to be, it is a proof that they are not designed for our climate, or at least for those persons who cannot obviate, by the use of wine and aromatics, the evil effects which their excessively cooling quality may produce.

Nothing can be more delicious than fruits. Every species has a flavor peculiar to itself: had they all the same taste, they would certainly lose much of their value; but this variety renders them vastly more pleasing. Thus, God resembles a tender Father, who provides not only for the support, but also for the pleasure of his children.

While using fruit, let us never forget the bounty of the beneficent Being who has dispensed them. Let us feel it our most sacred duty to consecrate ourselves entirely to the service of so tender a Parent. How great shall our happiness be, if we sincerely devote ourselves to

him ! What a blessed satisfaction, what pure and exalted pleasures shall we then taste ! And what a glorious hope may we indulge of future happiness !

## SEPTEMBER XXX.

A HYMN OF PRAISE TO GOD, IMITATED FROM PSALM  
CXLVII.

PRAISE ye the Lord, for he is omnipotent ! He counts the stars, and calls them all by their names. Earth and heaven celebrate him ; his name is great and glorious ; he governs with majesty : celebrate the Almighty !

Unite your voices to bless the God of love ! Ye who are distressed, come to him ; come to your Father ; he is gentle, merciful, and gracious ; everything proves that he is a God of grace and love.

His heavens become dark ; but it is to water the earth with fruitful rains. Our fields are covered with verdure ; grass grows, and fruits ripen ; for his clouds pour down his bounty. The Lord is full of kindness.

Let everything that has breath glorify the Lord ! Birds, beasts, fish, insects, nothing is forgotten ; all are objects of his care ; all are nourished by his bounty. Let us magnify and praise our heavenly Father !

Behold how he supports and comforts those who trust in his mercy ! Often, one friend cannot aid another ; and the greatest strength of man cannot save him from danger. Alas ! alas ! for the mortal who seeks vain supports ! Rest on the Rock of Ages ; he is the only Saviour.

Render him thanks, because he has made his will known unto you, and given you his laws and his precepts. His word is a source of life and salvation ! O ye people of his covenant, how great is your happiness ! Praise, celebrate, and exalt the God of truth !

## THE UNIVERSE INVITED TO PRAISE GOD.

GREAT is the Lord ! Innumerable heavens are his pavilion ; the thunder-cloud is his chariot, and the lightning walketh by his side.

The lustre of the morning is but the reflection of the hem of his garment ; when his splendour goes forth, the light of the sun is eclipsed.

Praise the mighty and gracious Lord, ye luminaries of his palace ! Ye solar rays, flame to his glory ! Thou earth, sing to his praise !

Celebrate him, thou sea ; foam, ye billows, to his honour ; ye rivers, praise him in your course ! Ye lions of the forest, roar to his glory ! Sing, sing to him, ye feathered inhabitants of the air !

Reiterate his praises, ye echoes ! Let all nature, in joyous concert, sing to his honour ! And thou, O man, lord of this lower world, mingle thy thanksgivings with the universal harmony.

He has done more for thy happiness than for all the rest ; he has given thee an immortal spirit ; thou canst comprehend the structure of the universe, and art acquainted with the wheels of nature.

Exalt him high for thy own salvation ; he needs not thy praise to render him happy. When thou soarest up to him, thy low desires and base inclinations shall vanish away.

Praise him when the sun rises from its ruddy bed ; praise him when it sinks down into the same ; to the voice of universal nature, let thy voice be at all times united.

Praise him in the rainy and dry seasons ; in the tempest, and in the fair weather ; when it snows, when the ice renders the rivers passable, and when the earth is covered with verdure !

## OCTOBER I.

## A HYMN TO THE PRAISE OF GOD.

ALL the heavenly host glorify the power and majesty of the Creator ; and all the spheres which roll in the immensity of space celebrate the wisdom of his works. The sea, the mountains, the forests, and the deeps, which a single act of his will created, are the heralds of his love, and declare his power.

Shall I alone be silent ? Shall I not chant a hymn to his praise ? My soul longs to soar up to his throne ; and if my language be imperfect, let my tears express the love I feel to my Father and my Friend.

Yes, my tongue is that of a stammerer ; but let the Most High see, that the holiest flame burns on the altar of my heart. But how shall I praise THEE ? Could I take the beams of the sun for my pencil, I could not sketch a single ray of thy essence ; the purest spirits can offer thee but imperfect praise.

By what power is it that millions of suns shine with so much splendour ? Who has traced out the wonderful course of those rolling spheres ? By what bond are they connected ? By what power are they influenced ? It is by thy breath, O Jehovah ! It is by thy almighty word.

All proceeds from thee. Thou didst speak, and worlds sprang into existence ; then was our globe produced. The birds and fish, the cattle, and the wild beasts which sport in the forests, and finally man himself, came to inhabit it, and rejoice in thy works.

Thou cheerest our sight with delightful and variegated prospects ; our eyes wander over the green field, or contemplate the forest which seems to touch the clouds ; sometimes they view the sparkling dew-drops, with which thou waterest the flowers ; or follow the windings of the limpid stream, in which the trees are reflected.

In order to break the violence of the winds, and at the same time to afford us the most enchanting prospects, the mountains rise, and from them the whole-

some springs proceed. Thou waterest the dry vallies with rain and dew ; thou coolest the air with the gentle breeze.

It is through thee that the hand of spring spreads the green carpet under our feet ; it is thou who gildest the ears of corn, and tingest the grape with its purple hue ; and when the cold comes to benumb nature, thou wrappest her up in a glittering veil.

By thee the human mind penetrates even to the starry heavens ; by thee man knows the past, and can discern truth from falsehood, the appearance from the reality ; by thee he judges, desires, or fears ; by thee he conquers death, and escapes from the tomb.

Lord, my tongue shall rehearse thy mighty acts ; only disdain not the praises of him who, before thee, is but a feeble worm. Thou, who readest my heart, deign to accept the emotions which it feels, and the gratitude which it is unable to express.

When thy mercy shall encompass my head with an immortal crown, and I shall be presented faultless before the presence of thy glory, then shall I exalt thy majesty with praises more sublime. O happy moment ! long desired, and ardently wished for, hasten thy appearance ! Then shall joy, without any mixture of sorrow, for ever overflow my heart.

#### OF FINDING THE DISTANCES OF THE HEAVENLY BODIES.

MAN is not only furnished with senses, but with reason also, that he may employ those senses to advantage.

This is particularly the case with respect to sight. We not only can see the objects around us, and enjoy the blessings of vision, in common with other animals, but by our reasoning powers we are capable of deriving advantages from it, for increasing our knowledge and promoting our happiness.

When we view the heavenly bodies, they are apparently on the surface of a sphere, all equally distant from the eye. This distance is very great ; but how great it is, or whether these bodies be at equal distances from us, or otherwise, notwithstanding we see them so clearly,

we could never know without the aid of reason. But this faculty furnishes us with the means of coming to the certain knowledge that those resplendent bodies are really at very different distances from us, and from each other, and also of finding very nearly, with respect to many of them, what that distance is. The unskilful in geometry and astronomy may deem this impracticable ; but a little attention to the subject may convince him of its reality.

Thus, if we wish to know the distance of a remote object in sight without going near it, we have only first to measure, with accuracy, a straight line in any convenient situation, erecting objects at each end of this measured line. We have now only to take from each of these extremities, the position of the remote object, and these data will suffice for finding the distance of the remote object from either end of the measured line ; because that distance depends on the change of position, or parallax, which is observed in the remote object in going from one end of the measured line to the other : the less that change is, the greater will be the distance sought. On the same principles the distances of the heavenly bodies are found.

If a straight line be assumed on the earth or in space, of a given length and position, and if we conceive a heavenly body viewed from one end of this line in some particular position, then if we could ascertain the change of position or parallax which would occur from viewing the body from the other end of that line, called the base line, we could easily calculate the distance of that body. The semi-diameter of the earth is the base line, generally taken. The chief difficulty is to find the parallax. The parallax of the moon is about one degree, being variable, because her distance from the earth is variable. Her distance is hence found to be about sixty semi-diameters of the earth, or 240,000 miles. The parallaxes of the sun and planets are so very small, on account of their great distances, that a very small error in measuring them produces a very great error in the calculated distances. Here is a great difficulty ; but the mind of man is seldom without resources. The transits of Venus afford a method of finding the parallactic



angle of the sun, and to this we owe the great accuracy by which the distance of the sun is determined, and consequently those of the other planets.

The sun's distance from us is about 95,000,000 of miles, and the distance of the most remote planet known, the Herschel, is 1,800,000,000 of miles from the sun. We hence form notions tolerably correct of the dimensions of the solar system. The distances of the planets being known, it is an easy problem to find their magnitudes, because their apparent diameters may be measured. But it is not even probable that we shall ever be able to find the distance of the nearest fixed star; for if we take the diameter of the earth's orbit, which is 190,000,000 of miles, for a base line, it is found that the star has no sensible parallax, but appears exactly in the same position when viewed from both extremities of this immense base. This, however, is proved by it, that the whole solar system is but a mere point of no sensible magnitude, in comparison of the distance of the nearest fixed star; and a luminous body, large enough to fill the extensive orbit of the planet Herschel, would appear but a mere twinkling point, if seen from the nearest fixed star. How small a portion, then, of the universe, is our sun, with its system of planets and comets!

The best observers, who have attempted to find the parallax of the fixed stars, are of opinion, that that of the nearest star, on the base above mentioned, is less than one second; but allowing it to be so much, then the distance will be more than 20,000,000,000 of miles.

It would require three years for light, which moves 12,000,000 of miles in one minute, to travel throughout this space; hence 12,000,000 of miles is as small a part of the distance of the nearest star, as one minute is of three years, or even smaller.

Admitting that the medium distance of the stars from each other is as much as this distance, how amazing the sphere occupied by the stars which may be seen from our earth! "O Lord, what is man, that thou art mindful of him; or the son of man, that thou visitest him?" It is because thou gavest him a living soul from thyself, and madest him capable of loving and enjoying thee in this habitation in which thou hast placed him,

and in all places of thy dominion to which thou mayest lead him in the riches of thy loving-kindness.

## OCTOBER II.

## THE EFFECTS OF FIRE.

NOTHING in nature can exceed the violence of fire ; and we cannot without astonishment reflect on the effects which it produces in all bodies, and the extreme activity of its particles. But how few attend to these effects, or judge them worthy of their observation ? In all our domestic affairs, we daily feel the beneficial influence of fire ; and perhaps this is the reason that we commonly pay so little attention to it. It is my duty, however, to put the reader in mind of this divine benefit, and cause him, if possible, to feel all its worth.

One effect of fire, which falls under every person's notice, is that of dilating the bodies which it penetrates. A piece of iron, fitted to a hole in a metal plate, so that it may easily pass through when cold, will not enter when hot ; but let it cool, and it passes through as easily as before.

This dilation, produced by fire, is still more sensible in fluid bodies, particularly in wine, beer, and air ; were it not for this, the thermometer, by which we measure the different degrees of heat, would be entirely useless.

Observe the effect of fire on compact inanimate bodies ; how soon do they melt and are changed, partly into a fluid, and partly into a solid of a different sort ! It communicates fluidity to ice, oil, and all fat substances, and to metals in general. What renders these bodies susceptible of this change is, that either combination is more simple, and that the particles of which they are composed are more homogeneal than those of other bodies. The fire penetrates their pores more easily, and succeeds sooner in separating the parts from each other. Hence it is that some of these matters evaporate when the fire penetrates them in too great a quantity, and with too much violence. Some solid bodies undergo other

changes: sand, flint, slate, quartz, and spar vitrify in the fire; clay is changed by it into stone; marble, calcareous stones, and chalk are turned into lime. These different effects do not proceed from the fire, but from the different properties of those bodies on which it acts. It may produce three different effects on the same body, viz., melt, vitrify, and reduce it into lime, provided the body be composed of three different matters; the one metallic, the other vitrifiable, and the third calcareous. But fire by itself produces no new substance, it only discovers those parts which were before hidden in the bodies on which it acts.

As to fluids, fire produces two effects on them: it causes them to boil, and reduces them to vapour. These vapours are formed of the most subtle particles of those bodies, united to particles of fire. Hence it is that the vapours ascend, because they are lighter than air.

As to animals, fire produces through all parts of their bodies the sensation of warmth. Without this element the life of man could not be preserved; for a portion of fire is requisite in the blood to keep it in motion. In order to preserve this motion and warmth, we every moment imbibe a portion of fresh air, to which fire is ever united; while, on the other hand, we expel the air which, having remained some time in our lungs, had lost its elasticity, and was loaded with superfluous humours.

All these reflections should confirm us in this important truth, that God refers everything to the welfare of mankind; and that he constantly places proofs of his love everywhere before our eyes. How many advantages accrue to us from the effects of fire only? By the union of fire and air the seasons are renewed, the moisture of the soil and the health of men preserved. By means of fire, water is put in motion; and without this it would speedily lose its fluidity. By its gentle action in all organized bodies, it brings them gradually to their complete perfection. It preserves the branch in the bud, the plant in the seed, and the embryo in the egg. It prepares our food properly; it contributes much to the formation of metals, and renders them fit for use. Finally, when we collect the various properties of fire, we may see that through it the Creator has dispersed a multitude

of blessings over the whole globe : a truth which ought to be deeply impressed on our hearts, and excite us to love the Author of our being, and inspire us with contentment. The more we search into the nature of things, the more we shall see that all concur to the accomplishment of the most perfect end. Everywhere we may observe magnificent plans ; a wonderful order, connexion, and constant harmony between the parts and the whole, the means and the end. To be convinced of this requires no extraordinary exertion of mind ; let us only contemplate nature quietly, and by the aid of our senses we shall in most cases be fully assured that all the works of God are full of wisdom and goodness.

### OCTOBER III.

#### THE INSTINCT AND INDUSTRY OF BIRDS.

BIRDS have already afforded us many innocent pleasures. Now that a great part of these sprightly inhabitants of the air have disappeared, and will not return for a considerable time, let us once more reflect upon them ; and let the subject excite us to meditate with the most lively sentiments of gratitude and joy on their Creator and ours. We may find great pleasure in considering the different instincts which God has given to birds. None of these instincts is superfluous or useless : each is indispensably necessary to the preservation and well-being of the animal ; and the little we know of this subject is sufficient to give us the most exalted idea of the wisdom and goodness of God.

In the first place, when we reflect on the instinct which leads birds to move, we may find in that alone a just subject of admiration. Experience may convince us that bodily motions require more than strength and well-formed pliant limbs. It is not till after many trials and falls that we are able to balance ourselves ; to walk with ease, to run, leap, rise up, and sit down ; and yet these motions seem more easy to bodies constructed like ours than to birds. These animals also have two feet ; but their bodies do not rest perpendicularly on them ;

they project both before and behind ; and yet a chick will stand straight, and run about almost as soon as it is out of the shell. Young ducks, just hatched by a hen, know their own element, and swim about in the water without example or instruction. Other birds know how to rise up from their nests into the air, balance themselves, pursue their course, making equal strokes with their wings in true time ; stretch out their feet to balance their body ; use their tail like an oar or rudder, to direct their flight ; and make long journies from their native country to unknown regions.

They also provide their food with admirable art—an art which they bring into the world with them. Some birds, though not aquatic, live on fish ; they must necessarily find it more difficult to seize their prey than water-fowl. Who teaches them their natural instinct in this case ? They stand on the brink of the strange element, and when a shoal of fish comes, which they can discover at a distance, they pursue them, skim along the surface, and suddenly dive into the water, and carry off a fish. Who gave the birds of prey their piercing sight, courage, and the weapons without which they could not possibly subsist ? Who points out to the stork the place where she may find frogs and insects to feed on ? In order to find them she must seek them, not only in the meadows, but also in the furrows of the field ; she must continue her search till near the morning, when the other birds awake. What incredible strength must the conder have, seeing it can carry away a sheep or a deer, and prey upon an ox ! How can we reconcile with the wild nature of the quail, a characteristic which no education can entirely correct, that maternal instinct which causes her to adopt little birds of every species, which she not only takes under her protection, but bestows on them the tenderest cares ? What cunning does the crow use to secure the prey which she cannot devour at once ! She hides it in places such as other crows do not frequent ; and when she is hungry again, how well does she know the magazine where she has laid it up !

We might spend many years in multiplying observations of this kind, without being able to explain the principal mysteries contained in the instinct of birds.

But even the little we do know of this subject may tend in a most pleasing manner to engage those whose hearts are disposed to contemplate the works of nature, and to exalt them to still more noble pursuits. To this point I wish to conduct the reader. Let none be contented with barely considering the instinct and faculties of birds ; this should be only the first step to sublimer meditations. Let our admiration of these faculties raise our hearts to that God from whom they have received them ; and who has prepared and combined so many things for the subsistence and multiplication of this part of his creatures. Let us not say that nature teaches these birds this art or that industry which surprises us so much ; if you separate nature from its Author, it is then a word destitute of meaning. Let us rather glorify the Creator, and acknowledge that it is HE alone who gives wisdom even to the fowls of the air.

## OCTOBER IV

### ANIMAL REPRODUCTION.

HERE we discover a new scene of wonders, which seem totally to contradict the principles which have been adopted relative to the formation of organic bodies. It has been long thought that animals could only be multiplied either by eggs or young ones ; but this principle must be admitted with some caution, as it is still liable to several exceptions. It is now found that there are some animal bodies which may be divided into as many complete bodies as we please ; for each part will speedily repair what is deficient, in order to make a complete animal, after having been separated from its original. It is now no longer doubted that the polypus belongs to the class of animals ; although it resembles plants, not only in its form, but also in the mode of its propagation. The bodies of these zoophytes may be cut either across or lengthwise ; and these bits will become so many complete polypes : even from the skin, or smallest bits cut off, there will grow one or more of these animals. And, if several bits cut off be put together at the ends, they

will reunite so perfectly, and nourish each other, that they soon become one and the same body. This discovery has given rise to other experiments, which have proved that polypes are not the only animals which can live and grow after being cut in pieces.

The common earthworm will multiply after being cut in two. To the tail part there grows a head, and the two parts then become two complete worms. After having cut the worm in two, it would be in vain to attempt to unite the parts; they will never join. They remain for some time in the same state, only grow a little smaller; afterwards, at the cut extremity, a little whitish button begins to appear, which grows larger, and then lengthens by degrees. Shortly after rings appear, which are at first very close together, but extend insensibly on all sides. It then forms itself new lungs, a new heart, a new stomach, and with these several other organs.

The following experiment may be made daily with snails. Cut off their heads close to their horns, and in a certain space this head will be reproduced.

A similar change takes place in crabs: break off one of their claws and put the animal again into its element, and in some time the claw will be entirely reproduced.

Another very wonderful experiment has been made by Mr. Dumahel, on the thigh of a chicken. After the thigh-bone, which had been broken, was perfectly restored, so that a callus was completely formed, he cut off all the flesh even to the bone; the parts were gradually reproduced, and the circulation entirely restored!

We are convinced then that some animals are perpetuated by being divided; and we cannot doubt that the young of certain insects may be produced in the same way as a branch is from the tree; that they may be cut in pieces, and the smallest piece become a complete animal; that they may be turned inside out like a glove, cut in pieces, and then turned again; and nevertheless still eat, live, grow, and propagate! Here a question arises, which no naturalist can answer in a satisfactory manner: How can these parts, thus cut off, be again reproduced? It must be taken for granted in this case that germs are spread through every part of the body, while in other cases they are confined to one part. These

germs unfold themselves when they meet with proper nourishment : thus in cutting one of these animals the germ is furnished with the requisite juices, which would have been conducted elsewhere, had not their course been thus interrupted. The superfluous juices cause those parts to unfold themselves, which without this would have continued attached to each other. Every part of the polype and the worm contains in itself all the viscera necessary to the animal, as the bud does all the rudiments of the tree. These parts, essential to life, are dispersed all over the body, and the circulation is carried on even in the smallest parts.

As we cannot comprehend all the means which the Author of Nature may make use of to distribute life and feeling through such a prodigious multitude of beings ; so we must not assert that the animals already mentioned are the only ones which, in reference to their mode of propagating, are exceptions to the general rule. The fecundity of nature, or rather the infinite wisdom of the Creator, must ever surpass our weak conceptions. The hand that has formed the polypus and the earthworm has showed us that it can, when necessary, simplify the animal constitution. It has simplified them more still, and descending always by insensible gradations, has arrived at the utmost limits of animal nature ; but of these utmost limits we are ignorant : let us feel a deep conviction of this ignorance, and admire and adore the supreme wisdom. It is never more sublime than in those cases in which it is impossible for us to discover its footsteps.

These animal reproductions should remind us of the great change which shall take place in the day of the resurrection. What we see now in miniature, will be then manifested in magnitude. What we now observe in other bodies we shall then experience in our own : from the smallest particles a body will spring up, fitted for the enjoyment of an eternal felicity.



## OCTOBER V

## THE ORGANS OF TASTE.

WE should not be so happy as we really are if we had not the faculty of distinguishing different kinds of meat and drink by tasting. The great variety of fruit at this season may naturally lead us to reflect on this subject. Our pleasure would be greatly diminished if the pear, the apple, the plum, and the grape, had all the same flavour. The power to distinguish them, or, in other words, the sense of taste, is a gift of God's goodness, and a proof of his wisdom, on which we should reflect with gratitude to our Creator.

But by what means do we taste and distinguish our food? The tongue is the principal organ; and, that it may answer this end, its surface is covered with nervous papillæ, by means of which we distinguish the flavour of the salts which dissolve on the tongue. Tasting, therefore, depends on the nerves; and this is clearly seen in dissecting the tongue; for, after the membrane which covers it is taken off, a multitude of roots where the nerves terminate appear, and these are the nervous papillæ that give us the sensation of taste; and where these are not, the sensation is wanting.

When we put highly flavoured things under the tongue, we are scarcely sensible of it till they are attenuated, and till we bring them on its surface, then we distinguish their flavour; consequently the sensation of taste is in its full force only where the nervous papillæ are most numerous; and this is the part nearest to the throat. To be further convinced that tasting is occasioned by the nerves, we need only examine the tongue of a dog or a cat. On their tongue the nervous papillæ are situated towards the root; the forepart is destitute, but the palate is covered with them; hence it is that these animals have no sensation of taste in the tip of their tongue.

Let us continue our reflections for a few moments longer on this subject. How ingeniously is this organ of taste formed; all the parts which no anatomist has

yet been able to find out! Is it not a proof of great wisdom that the tongue should have more nerves and fibres, in proportion, than any other part of the body; and that it should be full of small pores, that salts and all savoury particles should penetrate deeper, and in greater quantity, into the nervous papillæ? Is it not a proof of the same wisdom that the branches of the nerves, which are spread over the palate and throat to assist mastication, should extend their branches towards the nose and eyes, as if to inform the organs of sight and smelling that they should contribute their part toward the discernment of food? Another thing worthy of admiration is, the duration of the organs of taste. Notwithstanding the delicacy of their structure, they last longer than instruments of stone or steel. Our clothes wear out, our flesh fades, our very bones dry up; but the sense of taste survives them all. What admirable designs may we discover even in the apparatus of these organs! O man, thou art the only creature that knows he is endowed with senses, and the only one capable of raising himself towards God by the contemplation and use of these organs.

Strenuously endeavour, by the assistance of divine grace, to make a proper use of these faculties. If thou wilt not acknowledge the goodness of thy Creator who shall render him that homage? Thou enjoyest more through the sense of taste than any other creature; for the animals have but few things on which they like to feed; but thy Creator has prepared for thee meats and drinks as various as they are abundant. Reflect on the abundance which the animal, vegetable, and mineral kingdoms provide for thee. "Heaven and earth, air and ocean, pay thee tribute. Wheresoever thou turnest, thou mayest behold the gifts of God. The tops of the mountains, the bottom of the vallies, and the beds of lakes and rivers, furnish thee with aliments and pleasures."

It is reasonable that we should highly esteem this gift of our Creator; but let us not esteem it beyond the design of the donor. The sense of taste is given us to be the means of accomplishing a noble end. How indescribably foolish would it be to make the whole of our

happiness consist in those pleasures of which this sense is the organ ! and to live only to please the palate with savoury meats and delicious drinks ! Let us take care not to bring ourselves to a level with the brute, whose principal happiness consists in eating and drinking. Let us remember that we have an immortal soul, which cannot be satisfied but by the Supreme Good. To have a true taste for this good, earnestly to desire to be nourished by it, is that wherein the wisdom and true felicity of the man and the Christian consist.

## OCTOBER VI.

### THE GOVERNMENT OF GOD WITH RESPECT TO NATURAL EVENTS.

ALL the events which take place in the sky, on the earth, in the sea, and in the air, are regulated according to prescribed natural laws. But it would be foolish not to acknowledge a particular influence of God, which directs natural things according to his own views, and causes them to concur in accomplishing his own designs. He makes use of natural causes to chastise mankind ; and thus, at his command, the air is pure or corrupt, the seasons fruitful or unproductive. He prevents or assists the designs of men ; sometimes by winds and storms, and sometimes by the flux or reflux of the sea. It is true, that God does not in general interrupt the course of nature ; but it is equally true, that nature cannot act without his energy and concurrence. The parts of which the visible world is composed cannot use their power as they please ; and God can influence his creatures without reversing the order of nature. Fire, water, wind, and rain have their natural and particular causes, and particular virtues ; but God uses them in a manner suitable to their nature, to execute his designs. He makes use of the heat of the sun to warm the earth, and render it fruitful. He employs the rain and the wind to purify and cool the air ; but it is always in such a way, and in such a degree, as best consists with his own views.

A great part of the blessings and evils which we experience here below proceed from surrounding objects ; but as God interests himself in all that happens to man, he must of course influence these objects, and act through every part of nature. On this are founded the rewards and punishments of virtue and vice. Peace and prosperity crown the one ; and when he pleases, famine and pestilence scourge the other. In a word, all natural causes are in the hand of God, and immediately under the guidance of his providence. Men themselves furnish proofs of this. How often does their industry triumph over nature ! They cannot indeed change the essence of things, but they know how to use natural causes so that effects may result from them which would never have taken place had it not been for the art and direction of man. Now, if the Most High has in some measure subjected natural things to human industry, with how much more reason may he reserve to himself the direction and government of all these things ?

From all this we may conclude how necessary it is that a particular providence should watch over the government of the world. Natural causes are, doubtless, excellent instruments ; but in order that they may be useful, they must be put into the hands of a skilful workman. It would be an unreasonable wish that God would change the established laws of nature ; for instance, if we should fall at any time into the fire or into the water, that we should not be burnt by the one, or drowned in the other. Nor is Divine Providence obliged to preserve us when we shorten our lives by our own intemperance ; for it is not to be expected that God will work miracles to save men from those evils which they bring upon themselves by their irregularity and misconduct. It is our duty to attribute to a particular providence all those kind dispensations which relieve our wants, and fill our hearts with joy. But all the disorders of nature are at the same time effects of the wrath of God, who makes use of them for the punishment of sinners. It is on this truth that, on one hand, we found our prayers and supplications for the blessings of heaven, peace of conscience, and fruitful seasons ; and on the other, our

thanksgivings to God for the manifold mercies we receive from his hand.

## OCTOBER VII.

### THE INEXHAUSTIBLE RICHES OF NATURE.

NATURE is so liberal to us, so abundant in means to supply the wants of all creatures, so rich in gifts, that they can no more be numbered than the drops of water in the ocean.

How many things does one single man need in the course of a life of sixty years ! How much is necessary for eating, drinking, clothing ; for the sweets, conveniences, pleasures, amusements, and duties of society ; without mentioning extraordinary cases, and unforeseen wants and accidents. From the king to the beggar, in all states, conditions, and ages in human life ; from the infant to the old man ; in all nations of the earth, and according to the different modes of life of the inhabitants ; each person has his particular wants : what suits one will not suit another, and all require different kinds of food, and means of subsistence. Notwithstanding this, we find that nature provides for all, and liberally supplies every want ; so that each individual receives all that is necessary for his support. Since the foundation of the world the earth has not failed to open her bosom ; the mines have not been exhausted ; the sea always furnishes subsistence for an infinity of creatures ; and plants and trees have always produced seeds and germs, which shoot forth and become fruitful at their proper seasons ; beneficent nature varies her riches, that she may not be too much exhausted in one place ; and when one kind of plants, fruits, and other provisions begins to fail, she produces others, and does it in such a manner that the desire and taste of mankind should lead them to prefer those which are most abundant.

Nature is also a wise economist, who takes care that nothing shall be lost. She knows how to turn everything to profit. Insects serve for food to the largest

animals: and those are useful to man, in one way or other. If they provide him not with food, they afford him clothing, or arms and means of defence; and some, which are not profitable for any of the above purposes, procure him at least useful medicines. Even when disease diminishes certain kinds of animals, nature repairs that loss by an increase of others. Even the dust, dead carcases, putrid and corrupted matter, are all made use of by her, either for food to certain insects, or manure for the earth.

How rich also is nature in beautiful and delightful prospects! Her most beautiful attire requires only light and colours; with these she is abundantly provided, and the appearance which she presents us is continually varied, according to the different points of view in which they are seen. Here the eye is struck with beauteous forms; there the ear is charmed with melodious sounds; and the smell is regaled by exquisite perfumes. In other places art comes in to add new embellishments to nature by a thousand labours of her industry. The gifts of nature are so abundant that even those which are continually used never fail. She spreads her riches over all the earth; she varies her gifts according to the different countries; she gives and receives; she establishes, by means of commerce, such relations and connexions between different countries, that her presents pass through innumerable hands, and increase in profit and value by this continual circulation. She combines and mixes her gifts, as the physician does the ingredients in his prescriptions; the great and the small, the beautiful and the homely, the old and the new, combined and properly tempered together, form one whole, equally useful and pleasant. Such, in the hands of God, are the inexhaustible riches of nature.

And what are we, that we should daily enjoy these blessings? How often has kind Nature in our behalf opened her liberal hand, and shed around us her abundant gifts! But how many spiritual blessings, infinitely more precious, fall to our lot! Nature is rich, but grace is infinitely more so. The former can only supply our temporal necessities; the latter satisfies the wants and enriches the poverty of our souls. The former undoubt-

edly provides a variety of pleasures ; but to the latter we owe blessings that shall last for ever ! Nature charms and invigorates our senses ; grace seizes on the whole soul, and penetrates it with ineffable joy. May we know and feel that we owe our all to the goodness of God ! May all the blessings with which he loads us from the kingdom of nature, and the kingdom of grace, kindle our love more and more, and perfect our confidence in him ! “ What ! shall we not glorify so good a God ? Shall we not acknowledge his bounty ? Shall we shut our ears when he calls ? Shall we refuse to walk in the path which he has marked out ? No ! Let us rather meditate on the love with which he has honoured us ; and let us love him who has first loved us. The Lord has never forgotten us a moment since we began to exist ; and while we live may we never forget HIM ! ”

## OCTOBER VIII.

### PETRIFACTIONS.

THE transition of different substances, from the animal and vegetable kingdom into the mineral, is a peculiarity of natural history, which is well worth our attention. Petrifications are properly a species of medals, the explication of which casts a great deal of light on the natural history of the earth.

The first thing to be remarked in petrifications is their external form ; this proves that these fossils have indubitably appertained to the animal and vegetable kingdom. We seldom find petrifications of any part of the human body ; and those of quadrupeds are nearly as scarce. The most extraordinary skeletons found in the earth are those of elephants ; some of which are found even in different parts of Germany. Petrifications of aquatic animals are frequently to be met with ; sometimes whole fish are found, the smallest scales of which may be easily distinguished. But all this is nothing in comparison of the multitude of shells and worms, apparently converted into stones in the bowels of the earth. Their number is not only prodigious, but there are so many

different species, that living animals, corresponding to some of them, are entirely unknown. Petrifications of marine substances are found in great abundance in all countries. They are found even on the tops of high mountains, some thousands of feet above the level of the sea. Many are found at different depths in the earth. All sorts of plants, and parts of vegetable substances, are found petrified in different strata of the earth ; but these are often the impressions only, the substances themselves being entirely destroyed. In many places whole trees are found buried at different depths in the earth, apparently converted into stone ; these petrifications, however, do not appear to be of an ancient date. But how have all these petrified substances got into the earth ? And particularly, how could marine substances get to the tops of such high mountains ? How could animals, whose ordinary habitation is the sea, and which belong to no other element, be transported so far from their natural abode ?

For this phenomenon different causes may be assigned. Probably these petrifications prove that the water has formerly covered the greater part of the earth ; and indeed, as in every place we search from the tops of mountains to the greatest depths of the earth, we meet with all sorts of marine substances ; it seems as if it could not be accounted for otherwise. The great quantity of petrified shell-fish found at considerable heights, and which form regular beds, incline us to believe that these heights made formerly a part of the bottom of the sea ; and this opinion acquires strength from this consideration, that the present bottom of the sea exactly resembles the surface of the earth. We have but a very imperfect knowledge of the manner in which nature brings about these petrifications. It is certain that no body can undergo this change in the open air, for animal and vegetable substances consume or rot in this element ; therefore the air must be excluded from the places in which these petrifications take place, or, at least, its action must be suspended. Dry earth has no petrifying quality ; as to running waters, they may form a crust on particular bodies ; but they cannot change them into stone. The very motion of the water prevents



this. It appears, therefore, probable, that petrifications require soft moist earth, greatly impregnated with dissolved stony particles. These stony fluids penetrate the pores or cavities of animal and vegetable substances, and become consolidated, as the parts of these bodies are dissipated by evaporation, or absorbed by alkaline substances.

From what has been remarked, we may draw some consequences which throw light on this phenomenon. 1. All animals and vegetables are not equally proper to become subjects of petrification; for in order to this, they require a certain degree of firmness, which prevents their rotting before this operation is completed. 2. Petrifications are principally formed under the earth; and the place where they are formed must neither be too wet nor too dry. 3. All stones which include petrifications, or constitute the matter of them, are not original productions, but such as are daily formed, such as calcareous stones, indurated clay, compacted sand, the loadstone, and similar substances. 4. Petrified bodies are of the nature of these stones, being sometimes calcareous, sometimes like slate, &c. 5. Hence it appears that petrification is not the transmutation of one body into another, but properly the substitution of one body for another; whose appearance and form the stony particles assume, for the reason given in the first inference.

If petrifications were of no other use than merely to throw light on the natural history of our globe, even on that account they highly deserve our attention. But we may also consider them as proofs of the operations and changes which nature works in secret; and in this also the wonderful power and wisdom of God are particularly manifested.

## OCTOBER IX.

### ALL THE OPERATIONS OF NATURE ARE GRADUAL.

WE may observe an admirable gradation in nature; or an insensible progress from the most simple to the most complex perfection. Therefore there is no inter-

mediate space which has not some characteristic of what precedes and what follows. In a word, there is neither void nor a break in nature.

Dust and earth are the principle and matter of the composition of all solid bodies. Therefore these are found in all bodies decomposed by human art. From the union of earth with salts, oils, sulphurs, &c., result different kinds of earth, more or less compound, light, or compact. These lead us insensibly to the mineral kingdom. There are a great variety of stones, and their form, colour, size, and hardness are very different. In them we find all sorts of saline and metallic particles, whence minerals and precious stones proceed. In the latter class of stones some are found which are fibrous, and have laminae, or a kind of leaves, as slate, talc, lythophytes, or stony marine plants, the amianthus, or stony-flower of mines; and these lead us from the mineral to the vegetable kingdom. The plant which appears to occupy the lowest part of vegetable gradation is the truffle. Next come the numerous species of mushrooms and mosses, between which mould on paste, &c., seems to form the connecting medium. All these plants are imperfect, and properly only constitute the limits of the vegetable kingdom. The most perfect plants are divided into three grand families, which are distributed over the earth, viz., herbs, shrubs, and trees.

The polypus seems to unite the vegetable and animal kingdoms. From its outward appearance this singular production might be taken for nothing more than a mere plant, were it not seen to perform real animal functions. This zoophyte seems to form the connecting link between plants and animals. Worms, which are at the commencement of the animal kingdom, lead us to insects. Those worms whose bodies are inclosed in a stony or scaly shell seem to unite insects and shell-fish. Between them, or rather next to them, are found reptiles; these, by means of the water-snake, are united to fish. The flying-fish leads us to fowls. The ostrich, whose feet very nearly resemble those of the goat, and who runs rather than flies, seems to connect birds with quadrupeds. And the ape joins hands with quadrupeds and men.

There are gradations in human nature as well as in

all other things. Between the most perfect man and the ape, there are an astonishing multitude of links. And how many must there be between the most perfect man and the lowest angel; and how many more still between the highest archangel and the Creator of all things! But we must not consider the Creator as any part of his chain. He holds the highest link in his hand, and connects the whole. As he made all things, so all depend on him. Here new gradations become evident; new plans, new beauties, and new perfections! But the gradations in the spiritual world are hidden from us by an impenetrable veil. However, for our comfort, we understand from revelation that the immense space between God and the cherubim is filled by Christ, who is God manifested in the flesh. By him human nature is exalted and glorified; by him we are raised to the first rank of created beings, and have liberty to approach the throne of the Supreme God.

Let us reflect on these gradations of nature; the little that has been said may suffice to show us that every being is intimately blended in its beginnings and endings with others, and that the whole universe is linked together in all its parts. There is nothing in it without design; nothing but what is an immediate effect from a preceding cause, or which does not determine the existence of something that is to follow. Nature proceeds not by leaps; all goes on gradually from the component to the composed; from the least to the most perfect; from the nearest to that which is furthest off; from inanimate to animate; from corporeal to spiritual perfection. But how imperfect still is our knowledge of this immense chain of beings! We have only a glimpse of this gradation; we know but a few of its boundaries, and some ill-connected, broken links of the great chain.

And yet, defective as our knowledge is in this respect, it is nevertheless sufficient to give us the highest idea of this admirable series and infinite diversity of beings which constitute the universe; and all leads us to that Infinite Being, between whom and us there is a distance which no understanding can measure. He is the only being who is beyond all the links of the chain of nature. From the grain of sand to the seraphim, every being

owes its existence to him. Let us often endeavour to ascend to him on the ladder of his creatures. From the dust out of which we were formed, let us on the wings of devotion soar to that God who is the first of beings; the infinite, the incomprehensible Jehovah! Let us long for the time in which we shall be introduced into the blessed assembly of glorified spirits; where the universe shall be unveiled before us, and where we shall know God as we have been known. While we live here below, we go on to perfection by insensible gradations. We proceed from ignorance to wisdom and understanding; from corporeal to spiritual; from weakness to spiritual strength. "Our life is only beginning; it is only in its dawn; let us expect a greater light. Let us not murmur against him who wills that we should sojourn here awhile in dust and darkness; he loves that dust which he has formed, and if found faithful, will one day raise us to the most exalted degrees of glory."

## OCTOBER X.

### THE FALL OF THE LEAF.

WE already begin to see the ravages which the approach of winter makes in the forests and in the gardens. All plants, a very few excepted, lose their leaves, which are one of their principal ornaments. But what can the cause of this be? That which seems the most natural is the cold; for as soon as the first frost sets in, the leaves fall in abundance, and the vegetables are soon spoiled of their dress. This, indeed, cannot be otherwise, seeing the cold causes a stagnation of the sap in plants, and prevents the leaves from perspiring. But cold is not the only cause of their fall, for this happens even in those winters when there is no frost, and to those trees which are kept in greenhouses to preserve them from the cold; it is probable, therefore, that other causes concur to strip the trees of their leaves; perhaps they wither because the root no longer furnishes sufficient sap for their perspiration, for it is evident that the branches increase for some time in thickness, when they cease to

grow in length. When, therefore, the branches continue to grow thick, and the stalks of the leaves do not increase, their fibres must be necessarily detached from the fibres of the branches, and then the leaves must fall of course.

But we must not suppose that these fallen leaves are entirely lost, and of no manner of use. Both reason and experience declare the contrary. Nothing is useless in the world, nothing perishes; and consequently the leaves which fall from plants and trees have their use; they rot and become manure for the earth. Snow and rain separate the salts from them, and convey them to the roots of the trees. Further, where the fallen leaves are strewed on the ground, they preserve the roots of young plants, become a covering for seeds, and keep up a proper degree of humidity and warmth. This is particularly the case in respect to the leaves of the oak. They furnish an excellent manure, not only to the tree itself, but also to the young shoots; and they are very useful for forest pasturages, as they favour the growth of the grass, which they cover, and on which they rot. These advantages are so important, that fallen leaves are seldom collected to make dunghills of, unless they have fallen in such abundance as rather to choke the grass than to nourish it.

Leaves may serve for manure in various ways. They are spread in stables instead of straw, and they make a very good litter for cattle; and sometimes they are mixed with other kinds of manure. The mould they produce is very useful in gardens, where layers are made of it, which contribute much to the growth of fruits and young trees.

But it may be said, that the fall of the leaf is peculiarly destructive to a multitude of insects which live on the leaves of plants and trees. It is true that autumn sweeps away whole swarms of insects with their nests; but does it follow hence that these creatures perish? Why may they not live even on the ground, under these very leaves which cover and protect them from the cold?

The fall of the leaf is an emblem, not only of life, but of the frailty of all earthly things. "I am as a

falling leaf; death walks by my side; to-day I may wither, and to-morrow be converted into dust."

I hang by a thread, and may be deprived of all my beauty and vigour in a moment. A little cold air may put a period to my life, and my body be turned into earth. But if we leave behind us the well-ripened fruits of righteousness, love, and holiness, we shall die honourably, and may leave this world without regret.

## THE STARRY HEAVENS.

THE heavens display to all the sons of men beauties which must be admired. The sun by day, with the moon and stars by night, and the majesty of the azure vault, strike with deep reverence every judicious mind. It is not to be imagined that all those bright lamps of heaven are equally distant from us. Astronomers have clearly shown that the moon is very near us in respect of the sun; and that the sun, with the whole solar system, is quite in our neighbourhood in respect of the fixed stars; and that even some of these are immeasurably further distant than others. Yet, notwithstanding this immense difference of distance, all these bodies appear equally distant. From whatever station we view the sky, the whole presents itself under the appearance of an extensive concave spherical surface, of which the eye is the centre. This happens from the constitution of the eye, which, being intended principally to be useful to us in near objects, is not calculated to perceive any difference of distance in bodies so very remote. Hence, wherever the eye is situated it is the centre of its own view; and whether we were placed on the moon, the sun, or any of the planets, we should see still an exact sphere of stars, having its centre in the place we occupy. In this spherical surface all the heavenly bodies seem to be either fixed in their place, or traversing it in various circles. The former have received the denomination of fixed stars, and the others, which are comparatively few, are the moon, the sun, the planets, and comets. The fixed stars visible to the naked eye are between two and

three thousand, but a good telescope opens to our sight thousands of thousands, an innumerable multitude; and the better the glasses, the more we discover. These are disseminated through the sky, not in regular order of equidistant position, but in groups, named asterisms, or constellations. A constellation is, therefore, an assemblage of stars seen near each other; and the better to distinguish them, astronomers have reduced them to the forms of various animals and known things, as men, bulls, bears, &c.; a crown, a harp, a balance, &c. These figures seem to be taken from the fables of heathen mythology, and are retained by the moderns to prevent confusion.

This division is of great antiquity. In the most ancient book of Job, Orion, Arcturus, and the Pleiades are mentioned; and in the writings of Homer and Hesiod we frequently meet the names of the constellations. How extensive the space through which these luminaries are dispersed! Let us but for a moment contemplate a truth well known to men of science, namely, that if we be removed from our present situation to any point of space within the distance of two thousand millions of English miles in any direction whatever, yet we should have the very same aspect of the fixed stars: such is the astonishing distance of the nearest of them, that two persons, stationed at the great interval of four thousand millions of miles, would scarcely, if at all, discern the least difference in their apparent positions, angular distances, magnitudes, or brilliancy. The same visible sphere, the same constellations, with the same number of visible stars in each, would be seen in the same part of the heavens, and in the same order; which things would also hold in respect of those stars which cannot be seen without a glass, called telescopic stars. Thus we behold a part of the dominions of Him who is Lord of lords; we are filled with reverence; we are struck dumb; praise sits silent on our tongues. We are astonished that we could revolt from his government, and still more that he should condescend to bring us back again to his favour and family. He puts life within us, and our silence should only break forth in expressions

of gratitude, joy, and holy songs of praise to Him who is the Author of our being, the Preserver of our lives, and the Redeemer of our souls.

## OCTOBER XI.

## DIFFERENT KINDS OF EARTH.

WE can only form conjectures concerning the inside of the earth. Those who work in mines have not been able to go lower than 900 feet. Were they to attempt to go much further, the great pressure of the air would kill them, supposing even that they could protect themselves from the water which increases in proportion as we descend. But what is the depth of 900 feet, in comparison of the semi-diameter of the earth, which is 3982 miles? The inside of the earth must consequently be in a great measure unknown to us. Miners themselves have scarcely as yet penetrated through its first crust. All that we know is, that after we have dug some hundreds of feet in depth, this upper crust is found to be composed of different strata or beds, placed one on the top of the other. These strata or layers are very much mixed, and their direction, matter, thickness, and relative position vary considerably in different places.

Generally under common earth in gardens clay and fat earth are found, and sometimes alternate layers of clay, sand, and marle.

The manner in which these different strata of earth are classed is quite arbitrary; they may be less or more extended; but in comparing the accounts given by different writers, the following appears to be the best; and this divides earth into seven different classes:—

1. Black earth. This is composed of putrefied vegetable and animal substances. It contains many salts and much inflammable matter. This is what is commonly called dung.

2. Clay. This is more compact than black earth, and retains water longer on its surface.

3. Sandy earth. This is hard, light, and dry; it neither retains water, nor is dissolved in it. It is the



worst kind of earth, though some kind of plants may grow in it.

4. Marle. This is softer, more mealy, and attracts moisture better.

5. Bog or moss earth. This contains a vitriolic acid, which is too acid for plants.

6. Chalk. This is dry, hard, and brittle; notwithstanding, a few plants can thrive in it. And,

6. Scabrous or stony earth. The smoothest stones, however bare of earth, are at least covered with moss, which is a mere vegetable production; and birch is known to grow between stones, and in the clefts of rocks, and grow also to a considerable height.

The Creator has most wisely arranged these different kinds of earths, of which the strata are composed. For, to mention only the principal advantages which result from them, these different layers of sand, gravel, and light earth give an easy passage to fresh water, which is filtered in passing through these different beds, becomes soft, and is afterwards distributed on all hands for the supply of men and animals. These strata are also the reservoirs and canals of springs and fountains. And it is remarkable, that such canals are found in every country over the whole globe, and that they are in general composed of light earth. If it be sometimes mixed with a more harsh and gravelly soil, the water is consequently still better purified. This variety of soils is of great utility in the vegetable kingdom; for it is owing to this that herbs, plants, and trees grow of themselves in certain countries, while in others they cannot be produced without the assistance of art. All that art can do is to imitate nature, which prepares and proportions to plants which grow of themselves the soil, nutritious juices, and warmth which are necessary to their vegetation. This same variety of soils is the cause why certain herbs, roots, and trees have their internal structure different from those of the same species which grow on other soils. It often happens that some plants thrive, while others languish in the same soil. The same fruits have a different flavour in some countries from what they have in others. Plants whose roots are weak, small, and delicate, and which have but little sap, should be sown

and planted in a sandy, light soil, that the roots may extend themselves without meeting with too much resistance ; a soil into which the rain may easily penetrate, and where the roots may not meet with too many saline, acid, or oleaginous particles.

It is asserted, that in the space of forty-eight hours lettuce, cauliflower, salads, &c., may be produced fit to eat, if the seed be first steeped in brandy, and the ground in which they are sowed mixed with pigeon's dung and powder of slacked lime. A proper preparation of the soil is indispensably necessary for vegetation.

What has been said should induce us to acknowledge with what wisdom the Creator has disposed each soil for the production of plants, and for the benefit of his creatures. It would, therefore, be very unjust to complain of the sterility of such and such soils, for the Creator has ever taken care that the different countries which he has assigned for the residence of man should produce everything necessary for his subsistence. If there be any soils which appear less fertile than others, the Creator has compensated that defect by greater advantages ; or he has given the inhabitants of such places greater skill and ability for labour.

## OCTOBER XII.

### WINE.

WINE is a gift of the divine goodness, and should excite our admiration and gratitude. It might have been thought sufficient that God has given us bread and other aliments necessary for our support in abundance ; but he has not confined himself to this ; he has provided also for our comfort and pleasure ; therefore, to render our lives still more comfortable, and to confirm and preserve our health, he has created the vine.

Other beverages, whether natural or artificial, do not produce these effects in the same degree. Wine alone has the power of banishing sadness, and of inspiring that cheerfulness which is equally necessary to the well-being of our bodies and minds. Its spirituous parts

speedily recruit our exhausted strength. Bread strengthens man for labour, but wine enables him to act with courage, and renders his labour pleasant. Spirituous liquors, produced by art, cannot diffuse over the countenance that air of cheerfulness which wine gives it. And here let us reflect on God, who has communicated to this salutary juice qualities so superior to the baseness of its origin, and the sterility of its native soil. The Creator has produced these effects by the mixture of oily, saline, and volatile particles, of which all wines are composed.

But how greatly is the divine goodness manifested in the abundance and variety of wines. Their different kinds are innumerable. They vary in colour, smell, taste, quality, and duration. We might almost say that there are nearly as many different kinds of wine as there are soils; for the Creator has assigned to each country such wines as are best adapted to the climate, the constitution, and mode of life of the inhabitants.

But how blameably have men acted in reference to the use of wine! There have been some legislators who have severely prohibited the use of it, and this, not by considerations drawn from the health and manners of the people, but for false reasons of economy, and sometimes merely from fanaticism. It is at least certain, that to these causes united we must attribute Mohammed's prohibition of this liquor. This objection to wine is the more unreasonable, as the greater part of the people who prohibit the use of the liquor permit the eating of grapes.

Another fault of which men are guilty is the adulteration of wines, especially that which is made by lime, whitelead, litharge, and other noxious ingredients. In this the human heart discovers itself in all its deformity and sinfulness. Can there be anything much more detestable? A poor sick man endeavours to assuage his sufferings and recruit his exhausted strength by a little wine, which he purchases by a part of his scanty earnings; and they who adulterate this article have the barbarity to increase his sufferings, and render him more miserable, by presenting him with a poisoned cup, from which the unfortunate person drinks death instead of

the life and strength he expected ! But a still more shameful and deplorable abuse of it is, that some men, by an immoderate use of it, poison themselves. This liquor is a wholesome remedy ; it supports animal life, and contains vital spirits which warm and animate the humours, and increase and establish the strength. But its continual and excessive use prevents all these good effects. Thus used, it is to the human body what so much manure is to the garden : it hastens the fruit, but destroys the tree. A wise gardener will not continually manure and enrich his ground ; he does this only in proper measures and in proper times. He manures the trees when it is necessary, and gives them that portion only which their wants and nature require. This is the proper regimen for wine ; he who does not attend to it will ruin both his body and soul.

Let us profit by these counsels, and never use wine without reflection ; nor for the mere pleasure of drinking. Let us ever remember, that without the divine blessing the most necessary aliments would fail ; that it is our heavenly Father who gives this wholesome fluid to strengthen and refresh us ; and that without his blessing, wine itself would become a poison and a principle of death. We should seriously attend to these things, and think on the account we must give to God for the use we have made of the aliments which his divine goodness has granted us ; we should therefore take care that we abuse none of them, but make such a moderate use of wine, and every other blessing, that our health may not be injured, nor our understanding disturbed ; that we may never be found incapable of performing the duties which Christianity and our secular business require of us. We shall not then seek our happiness in wine, but, on the contrary, rather abstain from it, or any other gratification at particular seasons, that we may save something for the poor and the distressed. Thus the aliments which God condescends to give us will excite our gratitude and love more and more to the Dispenser of all good ; we should use them only that we may be the more fit to serve God with zeal and fervour, and fill up the duties of our respective callings. And we should remember particularly that these divine gifts, however

excellent, are the least of those which God's grace is unceasingly dispensing ; and that blessings and pleasures infinitely more perfect are reserved for the righteous in the world to come.

## OCTOBER XIII.

### THE MIGRATION OF BIRDS.

THIS is the time when most of those birds, which in summer found habitations and food in our fields, gardens, and forests, are about to leave our climate and pass into other countries. Very few spend the winter with us ; the yellow-hammer, the chaffinch, the crow, the raven, the sparrow, the wren, the partridge, the robin, and the fieldfare, are the principal. Most of the rest hide themselves, or leave us entirely. This migration is wonderful in every point of view : if, then, we have not sufficiently considered these creatures during their stay with us, we should at least pay some attention to them now, when taking their leave. Perhaps this may lead us to consider them more particularly when they return in the spring.

Some kinds of birds, without taking any high flight, or setting off in troops, draw gradually towards the south, to seek those seeds and fruits which they like best, but they speedily return. Others, which are termed birds of passage, collect at certain seasons, and fly off in large flocks to other climates. Some others are content to pass from one country to another at certain times, attracted by the air and food. Others pass the seas, and undertake voyages of a surprising length. The best known birds of passage are the quail, the swallow, the wild-duck, the plover, the snipe, and the crane, with some others, which live on worms. In spring the cranes pass from Africa into Europe, in order to enjoy a moderate warmth. They come in flocks often like clouds ; and sometimes, being nearly spent, they alight on vessels, and are taken without any difficulty. Swallows act in a different way : many cross the seas, and many continue in Europe, and hide themselves in holes of the earth, or

in marshes, fastening themselves together, claw against claw, and beak against beak. They pile themselves in heaps in such places as are unfrequented by men and beasts. Wild ducks and cranes also go at the approach of winter to seek milder climates. They all assemble on a certain day and set off in a flock. They commonly arrange themselves in two lines, united in one point like a wedge, or an inverted  $\Delta$ , with a bird at the head, and others following in the two lines, more and more extended. The duck or crane, which forms the point, cuts the air, and renders the passage easier to those that follow, whose beaks always rest on the tails of those before. The leader is charged with this commission only for a time; he passes from the head to the tail, rests himself, and is replaced by another. But all birds of passage do not go in flocks; there are some which travel alone; others with their females and young; and others in small flocks. They perform their journey in a very short time. It has been computed that they may easily go 200 miles in six hours each day, supposing they can take rest at intervals, or during the night. According to this calculation, they may pass from our climates to the equinoctial line in seven or eight days. This conjecture has been verified, as swallows have been seen on the coasts of Senegal on the ninth of October; i. e. eight or nine days after they left Europe.

These migrations cannot be too much admired. Doubtless the difference of heat and cold, and want of food, warns them to change their abode. But how comes it, when the air is so mild that they might still remain with us, and their food is still found in sufficient quantity, that they never fail to set off at the appointed time? How do they know that they shall find in other climates the necessary food and warmth? How is it that they all take their departure from us at the same time, as if they had beforehand unanimously fixed the day of their journey? How can they, notwithstanding the darkness of the nights, and their ignorance of the road, and the countries to which they go, still hold on a direct course? These and other questions on this interesting subject are very embarrassing, and hitherto have received no satisfactory answer; probably because we do not suffi-

ciently know the instinct and nature of those creatures. However, we must acknowledge the kind direction of Providence in these migrations. What wonderful means does Providence use to feed and preserve certain classes of birds! With what tender care does he provide for their subsistence when it fails them in some countries! Let us learn from this, that all in the great empire of nature is arranged with the utmost wisdom. Is not instinct the same to birds of passage as reason is to man? And does it not teach them what reason, if they had it, would dictate, viz., to change their habitations in proper time?

How much ashamed should we be of our unbelief, of our distrust and perplexities, when we reflect on these admirable directions of Providence! These voyages of the birds should instruct us in our duty. How is it that we so often abandon ourselves to discouragement, anxious cares, and fears! Will not that God who so guides the fowls of the air, lead us with equal tenderness, whom he has endued with reason? Can man, the king of animals, be less an object of the tender care of God than they? The whole earth is the Lord's; and should we be found in any country where we cannot fulfil the counsel of God, his beneficent hand can conduct us to such places as shall be more suitable to us. Let us, therefore, follow his merciful directions with confidence and joy.

"I will walk with God my leader, nor will I choose a crooked path, but take that which he marks out for me. He wills my happiness, and I cannot be miserable while led by my kind Father. I will therefore follow him step by step with a filial confidence."

## OCTOBER XIV.

### VARIETY OF TREES.

THE same diversity may be observed among trees as is seen in other parts of the vegetable kingdom. Some, as the oak, are distinguished by their strength and hardness. Others are tall and slender, as the elm and fir.

There are others, as the thorn and box-tree, which never arrive to a considerable height. Some are knotty and have rough barks, while others are smooth and beautiful, as the maple, the poplar, and the birch. Some are used in those precious works which adorn the apartments of the rich and great; while others are employed for the most common and necessary purposes. Some are so slight and weak that a little wind overthrows them; others are firm, and resist the violence of the northern blasts. We see some that grow to an extraordinary height and thickness; and each year, for a century past, seems to have added something to their size. Others require but a few years to come to their full growth.

Pliny admired, in his time, trees out of whose bark boats were constructed, capable of holding thirty men! But what would he have said of those trees of Congo, which may be hollowed out into boats capable of holding 200 persons! Or of those trees which, according to accounts of travellers, are eleven feet in diameter; and on which they can carry a load of four or five hundred quintals, or upwards of 50,000lbs. weight! There is one of this kind in Malabar, which we are informed is fifty feet in circumference! The cocoa-tree, which is a species of palm, is of this kind; some of them have leaves broad enough to cover twenty persons. The tallipot, a tree which grows in the island of Ceylon, and in height resembles the mast of a ship, is also celebrated for its leaves; they are said to be so large as easily to cover fifteen or twenty men from the rain. They are so pliant, when dry, that they may be folded up like a fan: in this state they are extremely light, and not thicker than a man's arm. Twenty-three old cedars still remain on Mount Lebanon, which some think have escaped the ravages of the deluge: if this be so, they must be the strongest trees in the world. A learned man who has seen them assures us that ten men cannot fathom one of them. They must therefore be thirty or thirty-six feet in circumference, which seems even too little for trees which are supposed to have lasted nearly six thousand years. The gum-trees which are found in the Ameri-



can islands are ordinarily twenty-six feet in circumference.

It is not likely that these cedars of Lebanon are as old as has been reported, although it is well known that some trees live to a very great age. There are apple-trees which are certainly not less than a thousand years old ! And if we compute the quantity of fruit which such a tree bears annually, we must, as has been noticed elsewhere, be astonished at the prodigious fecundity of a single pippin ; which would have been sufficient to have furnished all Europe with trees and fruits of this sort !

This great variety among trees should remind us of the difference we observe among men, relative to their occupations in life, their modes of thinking, their talents, and the service they perform. As there is not one well-grown tree in the forest which may not be of some use to its owner ; so there is no member of society but may be useful in his particular profession. One, like the oak, is remarkable for his firmness and unshaken constancy, which nothing can move. Another has not so much strength as the former, but he has more complaisance and address ; he becomes all things to all men, is as flexible as an osier, and bends with every breath. If he be an upright man, he will comply only in things innocent and lawful ; but if he be indifferent about God, his duty, and religion, he will always take the strongest side.

However different trees may be from each other, they all belong to the Ruler of the universe ; all are nourished by the same earth ; all are vivified by the same rain, and warmed by the same sun. Would to God that all men, whatever diversity there might be among them, would unite to acknowledge that they are all equally the creatures of God ; equally subject to his power, equally the objects of his tenderest cares ; that they owe their being and support to him ; and have received from his hands the various talents with which they are enriched ! The cedar which rears its majestic head on the top of Lebanon, and the bramble which creeps at his feet, are both nourished by the juices of the earth, and the rains of

heaven. Thus the divine blessing is equally necessary to the rich and the poor. The most eminent and most powerful among men should ever remember that they owe their elevation and grandeur to God ; that they are supported by him alone ; and that in a moment he can root them up, overturn, and reduce them to dust.

This consideration will help to repress every motion of pride which may rise in their hearts, and inspire them with that submission and obedience which they owe to the author of their being.

## OCTOBER XV

### TEMPERATURE OF THE WEATHER IN DIFFERENT REGIONS OF THE EARTH.

It seems that the state and warmth of countries should be regulated according to their relative position to the sun, as that planet casts his rays in the same way on all countries which are in the same degree of latitude. But experience teaches us that heat and cold, and temperature in general, depend on many other circumstances. The seasons may be very different in places under the same parallel ; and, on the contrary, are often very much alike in very different climates. As therefore accidental causes may make the heat very different in the same latitude, and since it is very far from being always such as the distance of the sun seems to require, it is difficult to determine exactly the seasons and temperature of any country.

The vicinity of the sea causes a milder climate. England and the coasts of Norway are indubitable proofs of this. The sea may be frozen near the shore because it is there mixed with a good deal of fresh water, but this does not take place at any considerable distance from the land ; partly because of the salt which is diffused through the sea, and partly because of its continual agitation. Thus the cold at sea never comes to the freezing point ; during the winter the adjacent countries benefit by it, the temperature of the weather being much milder. On

the contrary, the more a place is elevated above the surface of the water, the greater the cold is. The air is not only more thin, and consequently less warm, but the greater part of the heat which is produced by the earth's reflecting the sun's rays does not take place on high lands, but remains in low places and vallies, where the warmth is always greatest. Besides, if there be, as some think, a subterranean central fire, the higher lands are at the greatest distance from it. Quito is almost under the Line, but its elevation causes the heat to be more moderate. However, such countries have always a serene and light air, and the temperature is pretty equal. High mountains attract the clouds; hence rains and tempests are more frequent in hilly countries than elsewhere. And we know that it scarcely ever rains in the plains of Arabia. Countries where there are great and extensive forests are very cold; the ice in such places melts more slowly in winter, because the ground is covered with the shade of the trees. This ice cools the superior air, and this fresh cold prevents the thaw.

Though this subject is thus generally accounted for, yet it does not appear that the milder state of the air in the vicinity of seas is owing to the water not freezing; it may have a contrary effect; for as water arrives at the freezing point, and especially during the process of freezing, it gives out an abundance of heat, and absorbs much in thawing, and therefore tends to equalize the temperature.

What also moderates the heat in warm climates is, that the days there are not very long; and the sun does not continue long above the horizon. In colder countries the days are very long, and this is the reason why the warmth is greater in these places than might be expected. The serenity of the sky, the clear light of the moon, and the long twilights, render the long nights more supportable. Under the torrid zone the seasons are not distinguished so much by winter and summer, as by dry and wet weather; for when it ought to be summer, or when the sun rises most above the horizon, and the rays fall in the most direct manner possible, then the rains commence, and continue for a longer or shorter time. But in those countries, the most pleasant season

is when the sun has the least elevation. In the countries beyond the tropics, the weather is more uncertain than within the tropics. In spring and autumn the winds prevail most. In winter the earth freezes to a greater or less depth, but scarcely ever beyond three feet in our climate. In the more northerly countries it freezes much deeper in winter, and thaws but a few feet in summer. The ponds, lakes, and even the rivers are covered with ice, first near the shore, and afterwards over the whole surface. The different quality of soils, and the property they have of retaining less or more of the heat they have acquired, contribute something to the difference of climates.

In all these arrangements we may discover such wisdom and goodness as we cannot sufficiently admire. In regulating the temperature and seasons of different countries thus, the Creator has rendered every part of the earth habitable by men and other animals. We often form false ideas concerning the torrid and frigid zones, and foolishly imagine that the inhabitants of those regions must be the most wretched creatures in the universe. Happily for the world and for the great satisfaction of all feeling hearts, it is certain that the people of the most distant countries, not excepting even those under the line, or near the North Pole, enjoy a portion of happiness suited to their nature and destination. Every country has its advantages and disadvantages, which so counterbalance each other, that, laying prejudice aside, it would be difficult to determine which of these countries deserves the preference. There is no corner of the earth in which the goodness of God is not manifested. "From our climates to the most distant zones, all is full of the goodness of the Lord. All the inhabitants of the globe experience his paternal kindness. Not one of his creatures is forgotten. All that breathe derive life, nourishment, happiness, and joy from him."

## OCTOBER XVI.

## THE ATMOSPHERE OF THE EARTH.

THE air by which the earth is encompassed is neither so pure nor so subtile as the ether, being impregnated with a multitude of particles or exhalations, which are continually detached from the earth, and especially from the waters. This is called the atmosphere. Its lower region, or what is next the earth, is pressed by the superior air, and is consequently more dense. This is sufficiently evident to persons who ascend high mountains; their respiration becomes more difficult in proportion as they ascend. But it is not possible to determine the exact height of the atmosphere, for men cannot ascend very high in it. Neither can we infer with certainty, from the duration of twilight, how far the mass of air extends; for, granting that the morning twilight begins, and that of the evening ends, when the sun is eighteen degrees below the horizon, and that the latter is produced by the rays which strike the earth, and are reflected by the highest parts of the atmosphere, still there would remain many difficulties to be cleared up. However this may be, the atmosphere is generally divided into three regions. The lower region extends from the earth to the place where the air is no longer heated by the rays which the earth reflects. This region is the warmest. The middle region begins where the preceding one ends, and goes to the summit of the highest mountains, or even the highest clouds; this is the space where rain, hail, and snow are engendered. This region is much colder than the preceding, as it is not heated by the rays of the sun which pass through in a perpendicular line. But the third region is yet colder; it extends from the middle region to the utmost height of the atmosphere, but its limits cannot be exactly ascertained.

The particles which descend from the earth into the atmosphere, are of different sorts; some aqueous, some metallic, some sulphureous, &c. Now as some of these abound more in one place than in another, hence the

great variety in the air, which is very sensible even at a moderate height. A heavy air is more favourable to health than a light one, because it promotes the circulation of the blood, and insensible perspiration. When the air is heavy, it is generally clear; whereas a light air is generally accompanied with clouds, rain, or snow, which render it damp. Exhalations increase the weight of the air, and particularly when the heat causes them to ascend to a great height. The air continues light, notwithstanding the aqueous vapours with which it is filled.

Too great a dryness of the air is very injurious to the human body; but this seldom happens for any length of time, except in sandy countries. A damp air is very unwholesome, because it relaxes the fibres, obstructs insensible perspiration, and if heat accompany the dampness, it disposes the humours to putrefy. An air too hot dilates all the fluids of the body, and occasions sweatings, which bring on weakness and oppression. On the other hand, when the air is too cold, the solid parts contract excessively, and the fluids are condensed; hence result obstructions and inflammations. The best air is that which is neither too heavy nor too light, too moist nor too dry, and which is not impregnated with noxious vapours.

It is in the atmosphere that clouds, rain, snow, dew, lightning, and many other aërial phenomena are engendered. It is to the atmosphere that we owe our morning and evening twilight! As the rays of light are refracted and reflected, and bent in different directions in this mass of air, we see them before the sun rises, and enjoy them some time after he is set. Hence it is that the people under the polar circles enjoy some rays of light even while the sun is for a long time below their horizon.

The atmosphere is the habitation of the winds, which have such influence on the fertility of the earth and the health of men. Cities and provinces would be speedily deprived of their inhabitants, and changed into dreary deserts, were the air never to be agitated. The whole world would become one charnel-house, if there were not frequent storms and tempests to purify the air, and disperse those noxious vapours and exhalations, the bane

of men and beasts, which are continually floating in the atmosphere.

What reasons have we to bless the Creator for this advantageous arrangement of nature? Were there no atmosphere, or were it different from what it is, our earth would be a chaos, a most wretched abode for its different inhabitants. Let us acknowledge with gratitude the gracious wisdom of our Creator, who has regulated everything in nature, so as to promote the happiness of all the beings he has formed. We should always remember, that every advantage we derive from the atmosphere comes from that God who is the dispenser of all the blessings of nature. A proper consideration of the benefits which we receive from God cannot fail to excite every emotion of piety and gratitude. Let us love our Creator with our whole souls, and devote ourselves entirely to him.

## OCTOBER XVII.

### ANNUAL PROPORTION BETWEEN BIRTHS AND DEATHS.

THAT God has not abandoned the life of man, and the preservation of the human race, to blind chance, but watches over us with paternal care, evidently appears from the exact proportion in which, in every nation of the world, and in all times, men come into life, and depart from it. By means of this equilibrium, the earth is neither too thinly peopled, nor overstocked with inhabitants. Yet the number of those who are born is generally greater than those who die; for we find that twelve or thirteen persons are born annually for ten that die. Thus the human race is continually multiplying. Were not this the case, and were the number of deaths greater than the number of births, in a few ages a whole country would be depopulated, particularly as various accidents may injure population. The principal hindrances to population are pestilence, war, famine, celibacy, and confinement in cities, especially those which are very populous, for in such nearly as many die as are born.

Baptismal registers show us, that more males than females are born. The proportion is nearly twenty-one to twenty. So that where 1050 males are born, there are only 1000 females. But death, the military life, and divers accidents, restore the balance between the two sexes. In cities there are generally more women than men; in the country the case is reversed.

The number of children, relative to that of families, is also regulated with great wisdom. It is computed that in sixty-six families there are only about ten children baptized annually. In a populous country, out of fifty or fifty-four persons, only one marries each year; and each marriage, one with another, produces four children; but in cities, only twenty-five children are reckoned to ten marriages. Men capable of bearing arms make the fourth part, ordinarily, of the inhabitants of a country.

By comparing the bills of mortality of different countries it is found, that in common years, i. e., in such years as there is no epidemic disorder, there dies,

- 1 out of 40, in villages.
- 1 out of 32, in small towns.
- 1 out of 28, in middling towns.
- 1 out of 24, in very populous cities; and
- 1 out of 36, in a whole province.

Out of each thousand twenty-eight die annually. Out of 100 children who die each year, there are always three dead born, but there is scarcely one out of 200 that dies in the birth. Out of 115 women that die, only one dies in childbed; and but one out of 400 dies in labour. The greatest mortality among children is in the first year. Out of 1000 about 298 die before they are one year old. Between the first and second year only eighty die out of 1000. But from the thirteenth to the fourteenth or fifteenth years, the number is so small that it scarcely ever amounts to above two in 1000. This therefore is the time of life in which there is the least danger. Some learned men have observed, that there are more women than men who live from seventy to ninety years, but that there are more men than women who exceed ninety and live to 100.



3,000,000,000 of persons at least may live at one time on the earth ; but there is scarcely one third of that number, or at most 1,080,000,000. Some writers have given the following proportions : 650,000,000 for Asia, 150,000,000 for Africa, 150,000,000 for America, and 130,000,000 for Europe.

The most natural inference to be drawn from this is, that God is most tenderly concerned for the life of man, and that it is precious in his sight. Is it possible that such proportion could exist between births and deaths, and that this should be so regular and so constant at all times, and in all places, if the wisdom of God had not established and his province maintained it ?

### OCTOBER XVIII.

#### DEVASTATIONS IN THE KINGDOM OF NATURE.

WE now behold beauteous nature, which in spring ravished all our senses, and afforded us such diversified pleasures, subjected to the common law of all created things. Its beauty has disappeared, and every day brings about new revolutions ; and each succeeding one more disastrous than the other. But such is the lot of nature, it contains in itself the sources of the most afflicting devastations.

How much mischief is occasioned by the overflowing of seas and rivers, heavy rains, and the melting of snow and ice ! Whole villages drowned, fruit-trees torn up by the roots, crops of corn, &c., laid under water, whole herds carried away, present to our view fearful monuments of the destructive power of the elements.

A shipwreck appears a less fatal disaster ; but a whole commonwealth might have been formed by those men whom the sea has in this instance swallowed up. Immense sums, which probably whole ages were employed in collecting, lost in a moment ! Whole families are ruined by a shipwreck ; the appearance of the stormy sea, the lamentable cries of the dying, the crash of the vessel which is wrecked—what terror must all these things inspire !

What calamities also proceed from excessive heat, and a long drought! Grass and plants languish, the ground is dried up, and we are nearly stifled with clouds of burning dust. The waters grow gradually corrupt, and become a deadly drink for the flocks. Heat and putrefaction multiply insects prodigiously, and they lay waste all before them; they devour the country, and if they die to-day, they appear again to-morrow in new generations. Famine, the horrible companion of death, comes next, and the pestilence walks by its side! One bad year, a war, a contagious disorder, may occasion all these evils.

What confusion and desolation are produced by earthquakes, which become more and more common! Even in the very bowels of the earth, a destroying fire causes pestilential vapours to boil up, which spread death in all directions. Suddenly, and often in the dead of night, the earth bellows and shakes; whole cities are overturned, and thousands of criminals are swallowed up! With what a formidable aspect do volcanoes appear! They are emblems and forerunners of the devouring flames of the great and last day! Here we behold nature, in other respects so lovely, in a terrible point of view. At this awful spectacle we can scarcely refrain from saying, How imperfect and defective is everything except the Creator himself! Many people make nature their god, and its beauties cause them to forget that Supreme Being from whom these beauties spring. Let us learn the true state of all earthly things, and acknowledge the advantages which the love of God has beyond everything to which our hearts can be attached. To feel delight in the contemplation of the august attributes of God, to be made partakers of his grace, to feel that he is our sovereign good, is to triumph over all the desolations of nature. Besides, what can be more proper to increase our love and gratitude to him than the recollection that he well knows how to make all these calamities work together for our good?

These apparent disorders in nature prevent evils incomparably greater, which would not fail to take place if destructive matter, fire, and subterraneous vapours continued to be heaped and pent up in the bowels of the

earth. Volcanoes and inundations preserve us often from greater calamities. Burning heats serve to dry that ground which in other places had been laid under water. Plague and famine free the world from a multitude of its vicious inhabitants, under which it groans. The extraordinary mortality which sometimes prevails among men is a very wise means of maintaining the proper balance in respect to number, and of preventing an excessive population. Nevertheless we may grant that God would employ fewer scourges on the earth, if his holiness and justice did not oblige him thus to punish from time to time the crimes of those who inhabit it.

When we are mere spectators of the devastations which sometimes happen here below, and are not immediately interested in them, it is very right that our gratitude to the Supreme Being, who has preserved us, should be accompanied with sentiments of compassion and charity for our suffering fellow-creatures. Let us never be insensible to the misfortunes of others, nor hear with indifference the recital of the calamities of people the most remote, as if nothing should affect us but that in which we had a personal concern. In the immense chain of terrestrial events, there is not a single link, however distant, with which we have not some connexion. Were the wretched people who suffered so many distresses greater sinners than we are? Why are they fallen, while we stand upright? Are the places we inhabit less defiled with iniquity than those where earthquakes and volcanoes have made such ravages? The last catastrophe of our nature will be still more terrible to us. The world is not eternal; after having experienced excessive calamities of every kind, its utter destruction shall at last arrive. Nature still flourishes, but she visibly grows old. It is only by the dint of industry and labour that we derive from the earth what was spontaneously presented to our forefathers, and what they collected almost without trouble. Let this earth of our pilgrimage perish, seeing it must perish! Here we have no permanent city; may we know and seek that city which is above, whose founder and builder is the living God!

We should lament over those countries, towns, and villages which are laid waste; we should be ready to

succour them, and divide our bread with the wretched inhabitants. O that they may humble themselves under the mighty hand of God, and patiently suffer the ills which he sends them ! Let them recollect that many of their brethren have suffered similar distresses ; they were in misery, but their wounds are now healed, their granaries are now better supplied than they ever were, and their burnt houses are changed into palaces. To create and destroy is the work of God, and will continue to be so till the end of time. If he never destroyed, we should never see any new creations ; we should have no occasion for acts of resignation and patience ; we should not sufficiently know the value of that religion which now confirms and comforts us, and raises us above all afflictions and distresses. Here we have firm footing ; and let this be the result of all our reflections : God saw all that he made, and behold, it was very good. “ Yes, Lord, thou art clothed with splendour and majesty ; thy judgments are holy and just ; all thy works are full of grace and truth. Who would not acknowledge thy power and wisdom, and bless thee with transports of joy, thou Lord of the universe ! ”

## OCTOBER XIX.

### THE CIRCULATION OF THE BLOOD.

THE circulation of the blood is the most mysterious and important of all the motions performed in or by the animal body. In this circulation we observe a certain grandeur which strikes the mind, and makes us feel the limits of the human understanding ; and inspires us with a profound veneration for the supreme wisdom of our Divine Creator.

The blood circulates continually in our bodies ; and this is the principle of its motion. The heart, which is situated within the breast between the two lobes of the lungs, is a fleshy substance, which has two cavities, separated from each other by a partition. This machine is in continual motion by alternate contraction and dilatation. The trunk of an artery, which is called the aorta, or great artery, proceeds from the left ventricle of the

heart. It soon divides itself into many branches, some of which ascend, others descend, by innumerable ramifications, which become smaller and smaller, in proportion to their distance from the heart, distribute themselves on all hands, and penetrate every part of the body. When the right ventricle contracts it propels the blood into the arteries with so much force, that it goes into the very extremities of their smallest ramifications. This motion is called the pulse; it is only the effect of the pulsation of the heart, and is quicker or slower according as the heart contracts with more or less frequency. But what becomes of the blood after it has arrived at the extremities of the arteries distributed through the body? Nature employs it in the wisest manner. Certain vessels, through which the blood circulates, absorb the aqueous particles; others the oily, and others the saline. In other parts of the body where the arteries are dispersed, the milk or fat is secreted; or other humours which are necessary for certain purposes, or which should be expelled from the body as useless.

That part of the blood which remains after having been thus purified, runs into the extremities of the arteries in such a way, that with the help of a microscope the little red globules may be seen rolling one after another. But these small channels begin to grow gradually larger, forming vessels which still increase in wideness, and are termed veins; by these the blood is carried back into the heart in the same way that it had been conveyed from it by the arteries.

The veins therefore bring back the blood to the heart from all parts of the body, the lower as well as the upper, by a canal which opens into the right ventricle. It does not pass immediately from this into the left ventricle; but the contraction of the heart drives it into the pulmonary artery, which disperses it through the lungs by an infinite number of small branches. Here the blood which has circulated through all the body, and has acquired a certain degree of warmth by its agitation, must, before it recommences its circulation, be cooled by the fresh air, which is brought into the lungs by inspiration. By means of this cooling it condenses again, for during the circulation it was extremely dilated by the heat. It is now re-

ceived by the pulmonary veins, which conduct it to the left auricle of the heart: this restores it to the left ventricle, which by its contracting drives it again into the aorta, which distributes it to all parts of the body. Thus the blood circulates, passing from the heart to the extremities of the body, by the arteries; and returning from the extremities to the heart by the veins.\*

Such is the admirable mechanism of the circulation of the blood in men and animals. But how many obscurities still remain on this subject! We meet with wonders here which prove to us that the human mind cannot fully comprehend this masterpiece of Divine wisdom. For instance, is it not astonishing that the motion of the heart should continue without interruption for seventy, eighty, or a hundred years, and the machine neither wear out, nor fall to pieces? The blood circulates in the human body twenty-four times every hour, and consequently goes through the whole body 576 times every twenty-four hours; and as at each contraction the heart propels two ounces of blood into the aorta, it is evident that 7,200 ounces, that is, 600 pounds of blood, pass through the heart in the space of one hour!

May not this alone strike us with astonishment? But there may be many other wonderful circumstances in this circulation which we know not, or of which we have very imperfect ideas. In a word, "man, whose government is acknowledged by all things here below, is a composition of wonders. The most admirable mechanism, and the greatest corporeal beauty, are united in him. Each of his members proclaims him Lord of the creation. An innumerable multitude of invisible canals, so formed and measured as infinitely to surpass the wisdom and contrivance of man, conduct and distribute in every direction that precious fluid on which our life depends, and cause it to circulate regularly and without interruption. In this universal movement, in this continual flux and reflux, all is regular and well ordered;

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\* How the blood acquires and preserves its motion, what is the quantity of its circulating power, and what the cause of its colour, are questions not yet satisfactorily answered.—A. C.

everything is in its place, and in the most perfect harmony ; nothing is discordant, nothing obstructs, nothing stops, nothing precipitates its course.

This admirable circulation, which takes place in all animals, exists also in every part of nature. The sun revolves round his axis, and the earth, moon, and other planets perform their appointed revolutions with a regular and determined motion. Not only the air is in a continual motion, for it incessantly circulates around the earth, but the water also continues its course without interruption. The rivers fall into the sea, and from the vast surface of the ocean those vapours arise which form the clouds ; these are precipitated in showers, which penetrate the mountains and form springs ; which increasing, insensibly form rivers ; and these, returning to the ocean, restore what had been taken away by evaporation. The earth, ever fruitful, produces annual plants and crops, yet is never exhausted, because the continual circulation of nutritious juices repairs its losses, and restores to it what it had given to us.

All these revolutions of nature lead us to a First Cause, who has so planned the world that all beings are continually in action ; they circulate, act, and move in an insensible labyrinth of changes, till they return to their former place, and commence anew the race marked out for them.

## OCTOBER XX.

### PROPORTIONS OF THE DIFFERENT PARTS OF THE HUMAN BODY.

God has formed the human body according to the wisest rules, and established most exact proportions even in the smallest parts. To be convinced of this we have only to calculate the height and thickness of the body according to certain specified measures. The height of the body is generally divided into ten equal parts, which in technical terms are called face-lengths or faces ; because a man's face was the first model for these admeasurements.

The first face takes in the whole of the visage from the root of the hair on the forehead to the tip of the

chin. From the beginning of the hair on the forehead to the top of the head, there is one-third of the face in height; or what amounts to the same thing, a length equal to that of the nose; therefore from the top of the head to the bottom of the chin, the length is one face and a third. Between the bottom of the chin and the hollow of the collar-bone, there are two-thirds of a face: thus the height from the collar-bone to the top of the head is twice the length of the face; which is the fifth part of the whole length of the body. From the collar-bone to the bottom of the breast, one face is reckoned. Below the breasts the fourth face-length begins, which ends at the navel. The fifth extends to the bottom of the abdomen; which make in the whole the half of the height of the body. The length of the thigh is equal to two faces, and the knee to half the face. The leg, from the bottom of the knee to the instep, makes two faces; amounting in the whole to nine faces and a half. From the instep to the sole of the foot there is half a face, which completes the ten faces, the measure into which the human body is divided.

This division has been made for men in general; but where persons are very tall, there is found half a face more in that part of the body which extends from the breasts to the bottom of the abdomen. It is the extra length in this place which makes what is called a gentle shape. When the arms are so extended as to form a straight horizontal line, the distance between the tops of the middle fingers of each hand, is equal to the height of the whole body. From the hollow of the collar-bone to the joint which unites the shoulder-bone to the arm, there is one face length. When the arm hangs down it is computed at four face-lengths: two between the shoulder and the elbow, and two from the elbow to the first joint of the little finger; which make five faces for each arm, ten faces in the whole, which is a height equal to the length of the whole body. The hand is one face in length; the thumb the third of a face, or the length of the nose, which is also the length of the great toe. The length of the sole of the foot is equal to a sixth part of the height of the whole body. There is a particular measure also for the thickness of the body and



limbs. The thickness of a finger is ordinarily the thirty-sixth part of the height; the thickness of the little finger the forty-eighth part. Three times the thickness of the thumb is equal to the thickness of the hand; six times the thickness of the hand is equal to the whole height of the body.

The height of the human body varies considerably: the finest stature is from five feet four or five; to five feet eight or nine inches. The middle size is from five feet one inch, to five feet four. The least size is below five feet. In general, women are two or three inches shorter than men; their chest projects further, so that generally the capacity of the breast formed by the ribs is deeper and wider in women than in men, in proportion to the rest of the body. The loins of women are wider than those of men, because the bones which form that capacity which is called the pelvis, or bason, are larger than those of men. Man has more brain than any other animal of the same size. He has even more than the horse or the ox. A man who weighs a hundred pounds has commonly four pounds of brain. Infants born at the due time weigh eight pounds at most, and five at least; their greatest length is one foot eleven inches, and their least is one foot six.

The human body, whether it be considered in the whole, or in its different parts, is constructed according to the most exact proportions. All is regular, well-proportioned, and in the greatest harmony; not only as it respects the size and figure, but the situation also of the different parts. There is not one part which is greater or less than the relation it bears to other members and the general advantage of the whole machine requires. It is impossible to devise a form or situation for any part, which would be more convenient or beneficent to the whole of the members. It is granted, however, that there may be varieties and irregularities among them, which do not destroy the principal design of the body. Ill-shaped persons and monsters are proofs of these irregularities. But if certain disproportions in the size, form, and position of the parts may be compatible with the principal design, they still hurt the grace and beauty of the outward appearance. How great should the gratitude

be of those persons who are well-shaped, and whose members are all in just and agreeable proportion? O that our souls were as pleasing in the sight of the Lord as our bodies are in the eyes of men! When shall our souls and bodies be in the same harmony which prevails among the members of a well-formed body? When this takes place we shall be pleasing in the sight of our God, and glorify our Father and Redeemer with our bodies and spirits which are his.

## OCTOBER XXI.

## OF NAVIGATION.

To a reflecting mind, navigation is a subject which may give rise to the most important reflections. Here our curiosity is excited, and at the same time satisfied in different ways, so as to become a new source of pleasure. In general we consider navigation only in reference to the advantages it affords us; but we should also consider the construction and motion of ships, without which navigation could not exist.

Is it not very astonishing that such an enormous and heavy mass as a ship can float on the water? The weight of a ship is greater than we imagine; and it requires but little attention to be convinced that the pressure on the water must be prodigious. A man-of-war which carries 800 men has commonly provisions laid in to support that number for three months, and carries besides from 70 to 100 guns. Now supposing each man to weigh only 100 pounds, and each cannon 900, although there are cannons that weigh more than 40 hundred, and supposing that each man eats but three pounds' weight of food in the day, this moderate calculation will make the burden to amount to more than 386,000 pounds. But the weight of the vessel itself is not taken into this calculation; the rigging, and a multitude of materials necessary to keep the vessel in repair, load the cannon, &c., are articles which at least equal, if not surpass, the preceding sum.

However, this enormous mass of at least 772,000

pounds may be moved with a very gentle wind! Is not this inconceivable? Does it not appear contrary to the laws of nature? No. It is quite natural; and should the contrary happen, it would be miraculous. It is not the wind that drives this mass; the ship, with its whole burden, swims on the water. But how can so heavy a body float? How can the water, whose particles are not strongly connected, have strength and consistency enough to support this enormous mass? It is the effect of an equipoise; the ship sinks till the volume of water which it displaces be equal to it in bulk. Suppose a vessel to be 120 feet long, and 15 broad, and that it sinks two feet in the water, i. e., 3,600 feet of water, or so much cargo, because the one takes place of the other. Thus the river is not more loaded with the ship and her cargo than it was with the water which the ship removes from the place which she occupies.

Formerly navigation was very dangerous, and more laborious than it is at present. People did not dare to venture themselves far out in the open sea, but coasted along without losing sight of the shore. But since the invention of the compass they cross the seas with more confidence and safety. Before this valuable discovery, it was a sort of wonder to make even short sea-voyages. In Homer's time it required great preparations and long deliberation before his heroes could determine to cross the *Ægean Sea*. The expedition of Jason and his Argonauts to the island of Colchis was considered as the wonder of the world. But what are these in comparison of our sea-voyages? By the discovery of the compass we are enabled to make the longest voyages; the magnetic needle, turning always to the north, informs the navigator in what region he is, and the countries to which he directs his course. In the darkest night, in the most cloudy days, in the very midst of the ocean, this instrument serves him as a guide, and leads him from one end of the earth to the other.

Have we ever reflected on the advantages of navigation? Have we ever been sufficiently grateful to our Creator for these advantages? Whoever we may be, it is to navigation we owe, either directly or indirectly, a great part of the things necessary for our subsistence.

We could not have those spices and medicines which come to us from different countries; or, at least, could not procure them but at great trouble and expense, did not vessels bring them into our ports. We should be much distressed, indeed, were we obliged to bring all our necessaries by land. The following calculation will prove this. The freight of a ship is reckoned by tons; and a ton weighs 2000 pounds; therefore a vessel whose burden is 600 tons carries 1,200,000 pounds weight! Now, allowing 1000 pounds' weight to a horse, it would require 312 four-horse wagons, i. e., 1248 horses, with a man at least to each wagon, to transport this cargo. But how could we procure treasures from other parts of the world? and how expensive would it be to acquire even the bare necessaries of life! Besides, should not navigation be considered as one of the greatest blessings of our Creator, when we reflect that it has been the means of carrying the knowledge of the gospel of Christ to the remotest nations of the world? Can this consideration fail to inspire us with the most lively emotions of gratitude to God? On the other hand, should we not thank him that our calling does not oblige us to brave the dangers of the seas, and expose our lives continually in order to enrich ourselves, or to procure even the means of a bare subsistence? Whilst, then, at a distance from all these perils, we live peaceably among our families, should we not recommend those of our brethren to the protection of God, who are obliged to brave the seas, and undertake long and dangerous voyages for the benefit of society, and consequently for our particular profit?

## OCTOBER XXII.

## BEASTS OF DRAUGHT AND BURDEN.

ANIMALS of this kind render us so many services, and are so very useful, that it would be a sort of ingratitude not to examine them with particular attention. We generally content ourselves with subduing them for our food, or training them to assist our weakness by their strength; but through ignorance or indolence we neglect

to consider them in their relation to the rest of the creation, and to reflect on the wisdom and goodness of God, which are so visibly manifested in the production of these useful animals. Possibly the following meditation may make us more attentive to this subject, and serve to excite our gratitude to the Creator.

Of all domestic animals the horse renders us most service, and does it the most willingly. He suffers himself to be employed in the cultivation of our grounds. He tamely submits to all kinds of labour for a moderate and frugal subsistence. He shares with men the pleasures of the chase and the dangers of war. He is a creature who gives up his own being, to exist only by the will of another; he even anticipates this will, and by the promptitude and precision of his motions expresses and executes it. He abandons himself unreservedly to his master; refuses no labour; exerts all his strength; goes beyond it, and sometimes even expires in his efforts to obey. Nature has given him a propensity both to love and fear man, and has rendered him very sensible of those caresses by which his servitude is rendered pleasing. The horse, of all animals of his size, is the best proportioned in every part of his body. Every thing in him is regular and elegant. The exact proportion of every part of his head gives him a light and lively look, which is considerably heightened by the beauty of his chest. His carriage is noble, his step majestic, and all the members of his body seem to announce energy, strength, courage, and stateliness.

The ox has not the gracefulness and elegance of the horse; his monstrous head, his limbs too small and too short for the size of his body, the smallness of his ears, his stupid look and heavy pace, may be considered as imperfections; but all these irregularities are compensated by the important services which he renders to man. He is strong enough to carry heavy burdens, and is contented with scanty fare. Everything in this animal is of use; his blood, his hide, his hoofs, his flesh, his fat, and his horns, may be all applied to a variety of purposes; his very dung is the best sort of manure for enriching the land, that it may be capable of producing new aliments. The structure of the organs of digestion

in this animal is very remarkable. He has four stomachs, the first of which can contain forty or fifty pounds' weight of food; the third stomach God has so constructed, that it has eighty-eight folds in order to assist digestion; whereas the stomachs of sheep and goats have but thirty-six.

The ass, however unpromising his outward appearance may be, and however despised, has nevertheless very excellent qualities, and is very useful to man. He is not fiery and impetuous like the horse, but peaceable, simple, and always well-tempered. He has no stateliness, goes smoothly on his way, and carries his load without noise or grumbling. He is temperate both as to the quality and quantity of his food. He is contented with thistles, and the hardest and worst herbs. He is patient, vigorous, and indefatigable, and renders his master constant and important services.

How is it that we can have these animals daily in our employ, and not think at the same time of the Creator who has formed them, and given them those properties which are so useful to us. It is a circumstance well worth the attention of a reflecting mind, that the number of beasts of burden and draught cattle is, beyond all comparison, greater than that of wild beasts. If the multiplication of the latter were equal to that of the former, the earth would soon be laid waste. Can we reflect without gratitude on the goodness of God, who has given us the dominion over these creatures, the strength or skill to subjugate them, the right to apply them to our use; to change their natural state at pleasure; to oblige them to obey, and employ them as we think good? This dominion over the creatures is the gift of God, by which man may every moment perceive the excellence of his being. If God had not impressed animals with a natural fear of man, it would have been impossible for him to subjugate them by force. Seeing, then, that it is to God we owe the empire which we have over them, it is highly unjust to abuse these creatures, either by excessive labour, or by any other mode of ill-treatment.

## OCTOBER XXIII.

## WINTER SEED-TIME.

A GREAT part of the food designed for man and other animals is at this time confided to the earth. When the husbandman has sown his winter's corn he begins to enjoy a little rest. He will soon have the satisfaction of seeing his fields clothed gradually with a beautiful verdure, giving the promise of a plentiful harvest. Nature indeed works in secret while the germ is unfolding itself; but its operations may be discovered by taking some of the seeds out of the ground which begin to sprout. Two days after the seed has been sown, the juices with which it is swollen penetrate the germ, and cause it to shoot. The germ is always situated at one extremity of the seed, and that part which is next the outside is the little root of the future plant. Twenty-four hours after the corn has been sown, the germ commonly begins to pierce the coat of the grain, and to disengage itself. It puts out its root and stalk; the root is at first wrapped up in a sheath, which it bursts. Some days after, other roots shoot out at the sides, each disengaging itself from its sheath. On the fifth or sixth day a small green point begins to appear above the ground. It continues a considerable time in this state, till in fine weather the ear bursts forth from its coat, by which it had been protected from cold and uncertain weather.

All this necessarily leads us to reflect on the nature of human life. Our present existence is the germ of an eternal life. We are here below in our seed-time, and can discover but very little growth. The full ear, the ripe fruit, and the sheaves in perfection, we cannot see here below; the in-gathering is not made on earth. We live in hope. The husbandman, after having sown his field, abandons his seed to corruption, to rain and storms, and to the heat of the sun; but he does not yet see what the result will be. This is precisely what happens in regard to the spiritual seed. Let us not be proud because the seed is sown, nor be discouraged because we

do not immediately see the fruits. Let us continue to sow unto the Spirit; and possibly our good works, wrought thus in God, however trifling in themselves will have blessed consequences hereafter.

Now that our seed is committed to the ground, let us wait, without care and anxiety, till at the end of nine months we reap the fruit of our sowing; and in the mean time, like the pious husbandman, let us beseech God to crown our fields with his blessing.

## OCTOBER XXIV

### GOD'S PARTICULAR PROVIDENCE.

\* It would be a great misfortune for me and for the world, were there any foundation for that principle of unbelievers, that God concerns himself only with the totality of beings, and takes care of whole societies, of all genera and species, but not of individuals. What a ridiculous God is that of the freethinkers! Or, rather, does he deserve the name of a God, who either cannot or will not concern himself with the parts of which the whole is composed? For our comfort we are taught, both by reason and revelation, to believe in a God whose providence is extended to every creature in particular, and to every part of which each creature is composed.

Let none imagine that it is beneath God to attend to individuals. The whole universe, as well as the meanest particle of dust, is nothing in comparison of the infinite Being. This being the case, what is it that we can call little or contemptible? Is there not a greater difference between an individual and whole nations, than there is between those immense globes which appear so little to the eyes of the common people? The least consideration will be sufficient to convince us, that in the sight of God, to whom a thousand years is but as one day, and the whole universe as a drop in comparison of the ocean, there is nothing which is either great or little in itself, nor any event, however inconsiderable it may appear, that is unworthy his attention. Let us take the meanest plant, or the smallest insect that we can possibly dissect,



and we shall discover, even in its smallest parts, the same wisdom which shines in the structure of the whole. The least fibre contributes as much to the perfection of the whole plant or animal as they do to the perfection of the entire species, and as the species does to the perfection of the universe. If, therefore, God has not thought it beneath him to form creatures which appear so despicable, why should it be thought beneath him to preserve them? Besides, how could the whole be perfect, if the parts were not so? Or how could the whole species be preserved without the preservation of the individuals?

Plain reason proclaims this to us, and revelation completes our conviction. It teaches us that the very hairs of our head are numbered. A hair, the meanest appendage of our bodies, thousands of which we lose in the course of our lives without perceiving it, or suffering any sensible loss through it, even all these are numbered! And from this our blessed Saviour draws this conclusion, that with much greater reason God interests himself in our behalf, and condescends to honour us with his attention; and this he does more particularly because all men have been redeemed by the blood of his well-beloved Son, and have acquired new value in his eyes in consequence of becoming the brethren of the Lord Jesus.

O Eternal Providence! I adore thee in Christ Jesus; I adore and bless thee, O God, with the liveliest emotions of gratitude. Even before the foundation of the world thou didst lay the plan of my happiness; before I could supplicate, and before I could return thanks! Can it then be possible that thou shouldst now forget me? My Redeemer has undertaken for me; he has even suffered the most cruel torments in my behalf: can it cost him too much to watch over me? No. He will preserve what he has so dearly purchased. Shall we then permit ourselves to be stumbled by the raileries of vain and wicked men? No. Let us confide in that Providence which the infidel would wish to persuade us takes no care of its creatures. Let us consider that we were not formed for this world, and that it is only in the world to come that the wonders of God's grace shall be manifested to us in all their splendour. But what are we, O God,

that thou shouldst think of us ; creatures so base, corrupted, and sinful ? Who are we, that the Holy of holies, the Being of beings, the Almighty, Infinite, and Eternal God should pay any attention to us ? What is man, that thou art mindful of him ; and the son of man, that thou visitest him ? What motives should this afford us to walk before thy face in uprightness, abstaining from every appearance of evil ! Thy eye is ever open upon us, and thou art pleased that we confide in thy providence. Lord, strengthen our faith, that we may not be stumbled by the depth and obscurity of thy ways ; and grant that all the dispensations of thy providence may terminate in our endless salvation ! Amen.

## OCTOBER XXV

### THE MEASURE AND DIVISIONS OF TIME.

TIME is measured and divided according to the revolutions of the heavenly bodies, and especially by those of the sun and the moon. These two globes have most influence on the state of mankind. The revolution of the moon serves only to divide the time on our globe ; but the sun undoubtedly serves to regulate that division in all the planets which turn round him.

Day is that portion of time which the sun takes up in making an apparent revolution round the earth ; or, to speak more correctly, the time which the earth takes up in revolving round its own axis. That space of time during which the sun is above the horizon is called an artificial day ; this is the time of light which is determined by the rising and setting of the sun. The time of obscurity, that is, the time during which the sun is below the horizon, we call night. The day and night taken together make the natural or solar day. This day is divided into twenty-four parts, which are called hours. Each hour is subdivided into sixty equal parts, which are termed minutes ; each minute, into sixty seconds ; and each second, into sixty thirds. This division is capable of being extended still further, but it is seldom found necessary.

This division of the day into hours, minutes, &c., is pointed out by the shadow of the gnomon of a sun-dial, and by the hands of a clock or watch. Well constructed sun-dials always show the true time as indicated by the sun, called apparent time ; but clocks and watches, which are always regulated by the mean time of the sun, show equal time, and, except four days in each year, differ more or less from that shown by the shadow of the gnomon. In common life the greater part of Europeans begin their day and their hours at midnight ; from which to midday they reckon twelve hours, and twelve hours from that to the ensuing midnight. The Italians begin their day at sun-set ; and from that to the succeeding evening they reckon twenty-four hours. The Turks begin their day a quarter of an hour after sun-set, from which they reckon twelve equal hours ; and when these are run out, they reckon twelve more to the following evening. The Jews begin their day at sun-set, from which they reckon twelve equal hours to sun-rise, and as many more from his rising to his setting ; consequently the hours of their day are longer or shorter than those of the night, in proportion as the day is longer or shorter than the night.

A week is the space of seven days. A solar month is the time which the sun takes in passing through one sign of the zodiac ; but these months do not begin and end exactly at the entering of the sun into a new sign. A lunar month is the time which elapses from one new moon to another ; that is to say, twenty-nine days, twelve hours, and forty-four minutes.

The solar year comprises twelve solar months ; that is to say, the time which the sun takes up in going through the twelve signs of the zodiac ; and this time is generally computed to be three hundred and sixty-five days, five hours, and forty-nine minutes. These years are at present in use among all the people of Europe. The lunar year is that space of time which comprehends twelve lunar months, or twelve revolutions of the moon round our earth. It is composed of three hundred and fifty-four days, eight hours, and forty-eight minutes. The Jews and Turks still reckon by this year ; but to make it correspond to the solar year, they often inter-

calate a whole month. Our common year begins ten or eleven days after the sun has entered Capricorn.

These measures and divisions of time, however unimportant they may appear in themselves, are nevertheless of great consequence in their application to civil life. The hours, days, weeks, months, and years, which constitute our earthly life, are granted unto us that we may use them so as to fulfil the great design of our existence. But how do we employ these precious moments? Minutes and seconds are in our eyes but trifles, which do not deserve our attention. Nevertheless, it is certain that he who takes no account of minutes will throw away hours. But are we more economic in larger periods? Alas! if from all the days which have been allotted us we subtract those which have been entirely lost in respect to our immortal souls, how much of real and effective life will remain? Will it not appear as the result of this calculation, that man at the age of seventy years has lost fifty? And that he who has arrived to fifty years has scarcely spent seven of them in securing his eternal interests? O God of mercy, how distressing and humiliating is this consideration! What hundreds, what thousands of days and hours, which have been intrusted to us by thy fatherly goodness that we might employ them in promoting the eternal welfare of our souls, have been shamefully consumed in departing from thee, thou best and most tender of parents! How many years spent in idleness and vice, in gratifying criminal passions, and in injuring our brethren! And with what inconceivable rapidity do the few moments that remain fly away! Without scarcely perceiving it, an hour is already lost, irrecoverably lost! And an hour is a great deal to a man who may easily reckon his real and effective life by hours. Lord, enter not into judgment with us for the days which we have so miserably mis-spent! And so teach us to number our days, that we may apply our hearts unto wisdom! May we henceforth make a proper use of the time which thou mayest still condescend to grant us, by getting an interest in the grace of our Lord Jesus Christ, and an assurance of our eternal felicity! It is only by thus fulfilling thy merciful

designs that we can be said either to have lived long or lived happily.

## OCTOBER XXVI.

### THE END OF SUMMER.

THE SUN is casting the last of his summer rays upon the earth ; everything with us is changed. The earth, which a short time ago was so beautiful and fertile, is growing by degrees dismal, poor, and barren. We no longer see that fine enamel of trees in blossom, the charms of spring, the magnificence of summer, those hues and different shades of verdure in the woods and meadows, the purple colour of the grapes, nor the golden crops which clothed our fields. The trees have lost their late clothing ; the pines, the elms, and the oak bend under the fierce blast of the north wind. The rays of the sun are too feeble to warm the atmosphere, or penetrate the earth. The fields, which were so liberal in gifts, are now exhausted, and promise no more for this year. These melancholy changes must necessarily diminish our pleasures. When the earth has lost its beautiful verdure, its vivid colours, its splendour, in a word, its glory ; when the fields present nothing but a boggy soil and dull colouring, we lose that pleasure which we before received through the medium of sight.

When the earth is stripped of its crops, its grass, and its leaves, nothing is to be seen but a rugged and uneven surface ; it has no longer that striking appearance which the corn, herbage, and various kinds of pulse collectively produced. The birds cease from their songs, and nothing recalls to the mind of man that joy, that universal gladness, which he before shared with all animated beings. Deprived of the pleasure which the melodious concerts of birds afforded him, he hears nothing but the murmuring of waters and whistling of the winds ; a continual monotony, which can excite nothing but disagreeable sensations. The fields have lost their perfumes, and we respire only a sort of damp odour, which, as it is not

followed by the sensations of heat, has nothing agreeable in it. The sense of feeling is injured by the impression of cold and humid air. Thus the country presents nothing that can flatter our senses; the delicate nerves, which are their instruments, extend too much on receiving disagreeable impressions, and afterwards get into an extreme state of contraction. It is the same with all the muscles, to which the feeble rays of the sun can now communicate no energy.

But in the midst of these gloomy prospects we have still cause enough to acknowledge how faithful nature is to fulfil the eternal law prescribed to her, of being useful at all times, and in every season of the year. The winter approaches, the flowers disappear; and though the sun sometimes shines out, the earth no longer possesses her wonted beauty. Nevertheless, stripped and desert as the country is, it still presents to a feeling mind the image at least of happiness. With gratitude to heaven we may say, Here we have seen the corn grow; lately these barren fields were clothed with abundant crops; it is true that the orchards and gardens are stripped bare, but the remembrance of the presents which they have made us cannot fail to mingle a sentiment of joy with the shiverings which we feel through the influence of the bleak north wind.

The leaves of the fruit-trees are fallen; the grass of the meadows is withered; gloomy clouds cover the face of the sky; the rain falls in abundance; the roads are cut up; and pleasant walking is no longer practicable. The man who does not reflect murmurs at this; but he who is wise beholds with emotions of joy the earth drenched with rain. The withered leaves, and the yellow grass, are prepared by the autumnal rains to form a rich manure to fertilize the land. This reflection, and the pleasing expectation of spring, should naturally excite our gratitude to the Creator for his tender care of us, and should induce us to repose our whole confidence in him. Though the earth has lost its beauty, and all its external charms, and though it be even exposed to the murmurs of the children it has nourished and delighted, it has nevertheless commenced its labour anew, and is working secretly for their future welfare.

But why is not the moral world as faithful to accomplish its destination as the natural world is? The acorn will always produce an oak, and the vine grapes; why then has not the great man children which always resemble him? Why have men of learning and eminent artists ignorant and stupid descendants? Why do holy parents bring into the world vicious and wicked children? When we reflect on this difference we may find several natural causes for it; and we see that what often happens in the natural may also happen in the moral world, viz., that the best vine, for lack of a good soil and temperature, will produce bad and sour grapes; and virtuous parents may have degenerate children. In carrying these reflections further, may we not look back on ourselves and say, are not our brightest days often obscured, and has not the glory that surrounded us often disappeared like the leaves of the trees?

Possibly our lot here below may have a vicissitude of seasons. In such a case we should have recourse in the winter of our life, to the fruits collected in the days of our prosperity, and endeavour to make a good use of the fruits of our education and experience. If our harvest have been very productive, let us divide with the poor, whose rugged or ill-cultivated soil could yield but a small portion of fruit. Let us studiously endeavour, during the summer of our life, to have an autumn abundant in good fruits, honourable to ourselves, and useful to mankind. Happy if, at the end of our autumn, we may carry down with us into the grave the glory of having borne some fruit to the honour of God, and the good of society!

## OCTOBER XXVII.

### THE MAGNIFICENCE OF GOD IN THE WORKS OF CREATION.

God has manifested himself in the creation as a Being infinitely *wise*.

There is no creature, however useless it may appear to us, but what has its particular destination; and all are so formed as to answer, in the most proper manner, the

end of their existence. This we know certainly to be the case in those we are acquainted with, and we conclude the same of the others by analogy. If we begin with the sun, and descend to the smallest worm or plant, we shall be obliged to acknowledge that, in order to be properly adapted to the ends for which they were created, they could not have been formed in any other way ; and that, relatively to those ends, there is no defect in them. The very smallest parts of each creature are evidently well adapted to their particular uses ; they accomplish the functions which God has prescribed ; and the whole creature would be defective, and could answer but imperfectly the end of its existence, were any of its parts to be cut away or injured. And how wonderful is that whole which results from the relations and connexions which the creatures have among themselves. Each is in its place ; each has its proper functions ; and these functions are necessary to the perfection of the whole ; and none of these can fail without producing more or less disorder in the whole. When we represent to ourselves the Being who has formed this innumerable multitude of creatures, animate and inanimate ; who has not only designed each for a particular end, but has also disposed and arranged all its parts, so as to be most suitable to that end, without either superfluity or defect ; who, by the union of all the individuals, has formed an admirable whole, where the most perfect harmony prevails ; must we not be struck with astonishment, and cry out, O the depth of the wisdom and knowledge of God !

God has manifested himself in the creation as a Being infinitely *good*.

Everywhere he has dispensed being, motion, and life. What multitudes of animated beings has his beneficent hand produced ! Ever since the foundation of the world, man has endeavoured to find out all the living creatures which inhabit the earth, and yet new species are daily discovered which were hitherto unknown. Is not life an inestimable blessing to all that breathe ? Is it not a benefit even to the vilest worm ? What pleasure must God have in doing good, seeing he has communicated the blessing of conscious existence to so many beings !



But of what use would their existence be, were they to be immediately deprived of it? The Creator has taken care that every living creature shall exist as long as is necessary to answer his purpose in its creation. He has marked out to each creature the place of its habitation; and each finds at its entrance into the world whatever is necessary for the preservation of its being. Many animals bring into the world with them that instinct and industry which they stand in need of to find their food. Others, as man, are supported and instructed by their parents. And with what an inexhaustible fertility has God endued the earth for the benefit of mankind! For nearly six thousand years he has nourished so many millions of men and other animals; and were the world to subsist as long again, we need not doubt but he would continue to provide a sufficiency of nourishment for all succeeding generations. With life, how many pleasures and pleasing sensations does the Creator grant to animated beings, and especially to man? With what magnificence has he adorned and embellished the world, the place of his habitation! What comforts does he make him partaker of in social life! With what tender relations, warm affections, and delightful sentiments does he cheer his heart! Let us never be ungrateful to such an indulgent Creator! Seeing we are endued with reason; seeing we are capable of knowing and loving our God; let us acknowledge with transports of joy, that the earth is full of the loving-kindness of the Lord.

God has manifested himself in the creation as a Being infinitely *powerful*.

This unlimited power, which is seen at first view in all the creatures, may be still more particularly perceived in the two extremes; that which is greatest, and that which is least in the universe. Who but a Being infinitely powerful could have constructed the immensely extended firmament, that prodigious space in which such a vast number of huge worlds are contained? Who but himself could have hitherto preserved this vast edifice; established it so that it cannot be shaken, and yet support it in all its various and regular motions? Who else could raise the sun to such a height, appoint him his place, prevent his departing from it, and support him

without a prop in this immense space? Could anything less than infinite power give motion to the earth, the moon, and the other planets, so that they should revolve invariably in their appointed orbits, finish and begin afresh their revolutions at certain fixed periods?

If we consider the omnipotence of God in the smallest objects, here also we shall find it as incomprehensible as in the greatest. Let us only cast our eyes on the dust on which we tread. This dust is inhabited by an innumerable multitude of creatures, many thousands of which united would not amount to the size of a grain of sand! Nevertheless, each of these has all its external members and internal organs; each has its various sensations, each its peculiar instincts; is endued with the love of life, and seeks to preserve it. Behold the grass of the field, the hair of your head, and the blossoms of the trees; study their structure, their origin, and their use; and in all these you shall clearly discover the infinite power of Him who forms the celestial bodies with the same ease that he creates a worm, or causes a blossom to spring forth.

Lord, how great and numerous are thy works! In wisdom thou hast made them all, and the earth is full of thy goodness. Teach us to be as attentive to these things as we ought to be, that we may know thou art the Lord who madest the heavens and the earth. Let these considerations be the means of filling us with love to, reverence for, and confidence in this most amiable, most magnificent, and most powerful of all Beings!

## OCTOBER XXVIII.

### THE LAW OF INERTIA.

INERTIA is nothing more than the power of resistance, through which all bodies are disposed to remain in that state in which they are. When a body is at rest, it resists the motion which we desire to give it; but when it is once put in motion, it persists in it from the same cause of inertia, and resists as forcibly those bodies which

would stop its progress, as it did those which first put it in motion. Nothing can be wiser than this law which the Creator has established. Through this, bodies move with perfect regularity, and by it we can exactly determine the laws of motion and percussion.

If the celestial bodies had not this power of resistance, they could not move with so much order and regularity, and they must continually have a new moving cause to preserve them in motion. From this it appears that an infinite wisdom formed and arranged the universe. The suppression of any one part of the immense edifice would bring the rest into disorder. Of what use would the regular structure of plants and animals, and the admirable arrangement of the celestial bodies be, if these different bodies were not susceptible of motion? But how simple is this law, and how wonderful are its effects! Such are all the works of the Creator; the principles are extremely simple, but the whole edifice is so much the more admirable. The universe resembles a magnificent palace: the strong and rugged walls on which the building rests, appear to have neither elegance nor beauty; nevertheless they are so indispensable, that without them the least motion of the air would overturn the edifice.

However, even these apparently rough foundations have their beauty, though every person is not capable of discerning it. One must be an architect himself, or at least be well acquainted with the rules of this art, in order to be able to enjoy the pleasure which the construction and symmetry of the foundations afford. None but an artist can perceive why the foundation has that depth, breadth, and length which the architect has given it; he sees that it must be such as it is, that it may be what it ought to be; he has the satisfaction to be capable of forming a right judgment of the work, and he knows that the work is perfect. This is exactly the case in contemplating the works of God. Every spectator is not able to discover the fundamental laws on which the greater part of the phenomena depend, nor to find out the wisdom of the plan. This knowledge is reserved for the true philosopher, and is to him a source of inexpressible pleasure.

It seems as if there was also a certain inertia in mind, as well as in matter. Bodies which constantly move in the same way and to the same point have a certain tendency to it. The human spirit has a certain propensity to those actions which we have often in the same way repeated. Hence it is that we find such difficulty to conquer certain habits. Now we might make an excellent use of this natural inertness of our minds, in using it to strengthen us in virtue. In order to this we should often repeat the same acts, till we feel ourselves as much accustomed to good and virtuous actions as we are at present to those that are vicious. This is so much the more important, as without virtue we can never arrive at true and solid peace. But whence come the mistakes into which we so frequently fall in this respect? Why do we continually pursue imaginary good, which in the end leads us to destruction? Our hearts, seduced by that pride which is natural to them, and dazzled with the false splendour of sensible things, cause us reluctantly to approach the paths of uprightness. But let us not be discouraged with being obliged to do violence to our evil passions and propensities. The vicious themselves are often obliged to restrain and resist their passions, in order to procure some temporal advantage or to escape some particular danger. And the efforts which they are obliged to make in order to resist their sensual appetites and desires must be very bitter and grievous to men of corrupt minds. On the contrary, what pleasing satisfaction must they feel, whose souls have resumed the authority which they should ever maintain over their senses! A frequent exercise of this authority may be a means of conducting us to that happy state where the soul, elevated (so to speak) above the tumultuous region of passion, sees with pity the mean and despicable swarm of the slaves of vice.

There is a good deal of strength in the above reasoning; but I am firmly persuaded that a habit of righteousness never was and never can be acquired merely by a repetition of acts. The power of God alone can dispose the soul to do good; and it ever was and ever will be the prerogative of the grace of Christ to change the human heart. Yet he who acts in the above way, under the divine influence, will certainly succeed.—A. C.

## OCTOBER XXIX.

## THE WANTS OF MEN.

THERE is no creature on the earth which has so many wants as man. We came into the world naked, destitute, and ignorant. Nature has not endued us with that industry and those instincts which beasts have at their birth; reason only has been bestowed on us, that we might acquire through it requisite talents and knowledge. In this respect the state of the brute creation may appear enviable. Is it not happy for them that they have no need of the clothing, instruments, and conveniences which are so requisite for us; and that they are not obliged to invent and exercise that multitude of arts and sciences, without which we could not procure ourselves the necessities of life? They bring with them at their birth clothing, arms, and everything they need; and if they want anything, they can easily procure it by means of those natural instincts which they blindly follow. If they want dwelling-places, they know either how to dig or build them. Have they need of beds, coverings, changes of raiment, they know how to spin or weave them; to cast off their old garments and get new. If they have enemies, they are provided with arms for their defence; if they be sick or wounded, they know where to find proper remedies. Now we, who are so superior to all other animals, have more wants and fewer means of supplying them.

It may be asked, Why has the Creator in all these respects privileged man less than the beasts? This curiosity is doubtless excusable, provided it be unaccompanied with complaining. The wisdom of the Deity is manifested in this as well as in every other thing. In subjecting men to so many wants, God designed that they should be continually obliged to exercise that reason which he has given for their happiness, and which to us supplies the place of all the resources of other animals. And because we are destitute of those instincts with which they are endowed, we are obliged to use our

reason, in order to gain a knowledge of the world and of ourselves; to be active, diligent, and laborious, that we may guard against want, pain, and disappointment; and so lead a quiet and pleasant life. By using our reason, we see the necessity of bridling our strong passions, and avoiding those excesses which might prove fatal to us. A few examples may convince us of this. If we could procure fruits and all other necessary aliments without labour, we should infallibly become indolent and idle, and should spend our lives in the most degrading sloth.

The noblest faculties of man would be enfeebled and become stupid; the bonds of society would be broken; for men would no longer live in a state of mutual dependance. Even children could then do without the assistance of their parents, and would need no help from others. The whole human race would fall into a state of barbarism and savage stupidity; each, like the brutes, would live for himself, and there would be neither subordination, nor mutual obligations, nor good offices. It is to our wants that we owe the development of our faculties, and the prerogatives of humanity. They awaken the mind, dispose us to activity and industry, by which our lives are made more easy and pleasant than those of other animals. Our wants have made us sociable, rational, and regular in our manners, and have led us to invent a multitude of useful arts and sciences. In general, an active and laborious life is both useful and necessary to man. Were not his strength and faculties brought into action, they would become a burden to himself; he would gradually fall into stupid ignorance, into low brutal indulgences, and into all the vices necessarily resulting from them.

Labour, on the contrary, puts the whole machine into a pleasing state of action, and procures us satisfaction and pleasure, in proportion as it requires invention, reflection, and knowledge. Natural wants were to us indispensably necessary, that we might be rational, wise, social, virtuous, and happy. If, after having been fed with our mother's milk, we had no need of succour or instruction, we should live for ourselves alone, refer every thing to ourselves, learn no language, and make no use

of our reason. Stupid, and profoundly ignorant of ourselves and other beings, we should understand neither arts nor sciences, and be strangers to the noblest pleasures of the mind. But now the wants of children, and the helpless state in which they come into the world, oblige the parents, through pity and tenderness, to take care of them; while the children, on their part, are attached to their parents through a sense of their wants and a fear of danger; they submit to be guided and formed by their example and instruction; and learn from them how to use their reason and to act uprightly. Thus they may become worthy people and good citizens, and be enabled to lead an honest and happy life. Possessed of such advantages, we may easily dispense with those which the animals appear to have over us. We have no need of furs or feathers to clothe us; no need of teeth and talons to defend us; nor of certain natural instincts and sensations, to procure us the things necessary to our support and preservation. These gifts of nature would only degrade us, and bring us into a state of mere animal perfection. Our senses, our reason, and our hands suffice to procure us clothing, weapons, food, and every necessary for our safety, support, and pleasure, and enable us to apply to our use all the riches of the kingdom of nature.

We see, therefore, that the wants of which so many complain are the very foundation of our civil happiness, and the best means which the wisdom and goodness of God could choose to direct the faculties of men to their greatest advantage. Were they only wise enough to exercise themselves in this way, they would save themselves a great deal of trouble; not one in a hundred of the miserable could attribute his distresses to misfortune; and we should confess that the quantum of good far exceeds the quantum of evil; that our afflictions are softened by a thousand advantages, and that it is in our power not only to lead a tolerable but even a happy life.

## OCTOBER XXX.

## ON PRESENTIMENTS.

THE faculty which our souls have of foresight manifests itself by such extraordinary effects, that it must strike us with astonishment. The sensations and representations which foresight produces, are sometimes so obscure, and so wrapt up in the essence of the mind, that we are not conscious of them. The soul, however, draws very exact conclusions from them; and the image of the future presents itself clearly enough to convince the mind that has that preconception. It then forms conjectures and presages without knowing how it has been led to them, and in its astonishment often mistakes them for inspirations. This is what is called presentiment, when, without being able to account for the way in which we foresee a future event, we have notwithstanding an idea more or less clear of it. But it should be here observed, that presentiment is in its nature a representation much weaker than sensation; therefore it cannot be well distinguished when the senses and a heated imagination put the soul into a violent agitation. But when the soul is calm, presentiments are more clear; hence it is that they take place chiefly in the silence of the night, in sleep, and in dreams. At such times man is often raised above himself; the veil which covers futurity is drawn from before his eyes, without his knowing how it was done; and he can speak of future events, while he is scarcely able to see those which pass before his eyes.

A multitude of facts prove beyond a doubt that the soul has the faculty of sometimes foreseeing the future, and he must have a slight acquaintance with nature, who would deny a thing merely because it appears extraordinary or inexplicable. This secret and unknown emotion, which warns us sometimes of what is to happen, really exists in the essence of our souls; and history is so full of examples of this that we cannot possibly deny them all. Few persons have arrived at mature age



without having had some such presentiments. The soul is a representative power of the universe, in reference to the place it occupies in it ; it has the faculty of representing the past as well as the present ; why then may it not have the faculty of representing the future also, and even contingent events ? It may employ for this purpose means similar to those which it uses to represent the past. Provided it has been informed of past events, it can represent them as if they were present ; and why should we consider it an impossible thing that it should be informed of future events ? In the universe there are millions of intelligences superior to man, who may reveal to him some part of futurity ; or there may be in the human soul a certain power, hitherto unknown, which enables man to foresee distant and future events.

But, however obscure and inexplicable the cause of presentiment may be, it is enough for us to know that it may contribute in a direct or indirect manner to our happiness. At one time it may warn us of our approaching danger ; at another time it announces some pleasing and happy event. In both cases this presentiment may be very advantageous to us ; we have only to take care that this faculty of our soul become not our torment, but that it serve on the contrary to establish and increase our tranquillity. We must particularly guard against all superstition ; we must not trust too much to these presentiments, nor draw rash conclusions from them. They must not lead us to neglect the performance of any duty ; and we must never forget that God alone deserves all our confidence.

## OCTOBER XXXI.

### A HYMN ON THE POWER AND PROVIDENCE OF GOD.

God is my song. He is the strong God, the Lord is his name ; his works are great, and his government extends to the heavens.

He wills and speaks, and millions of worlds spring into existence ; he threatens, and worlds are reduced into dust.

Light is his garment; his counsels are wisdom and truth. As God he reigns; truth and righteousness are the foundation of his throne.

Monarch of all the world! Who is like unto thee? Without beginning of days, or end of time! The only, the never-ceasing source of glory, riches, and happiness!

All that is, was, or shall be, in heaven, earth, or sea, is known by the Lord. His innumerable works have been before his eyes from eternity.

He encompasses me; he watches over me; and under the shadow of his wings I rest in safety. None of my actions can escape his notice; he searches the heart.

He is nigh to thee; he knows thy rising up and lying down; he sees thy thoughts long before they are formed. Shouldst thou climb up to heaven, he is there; shouldst thou fly on the rays of light to the limits of the universe, he is there also.

He knows my troubles; he hears my prayers; he understands all that passes in my heart. My good and my bad actions are equally known unto him; and when I stumble, his merciful hand upholds me.

From eternity he has purposed my welfare; whatever concerns me is written in his book; his finger marked it down before I was born; as also the number of my days.

I have nothing but what has come from God. Lord, I am thine. It is by thy goodness I live. Therefore I will give glory to thy name, and thy praise shall be continually in my mouth.

Who can comprehend and recount the grandeur and magnificence of thy wonders? Every grain of dust announces the power of its Creator.

Thy wisdom is seen in the smallest spire of grass; air, sea, fields, vallies, and hills proclaim thy praise.

Thou waterest the earth, and spreadest a verdant carpet under our feet; we are encompassed by thy mercies; the day and the night, the corn and the fruit of the vine, plenty and joy, all come from thee

A sparrow falls not to the earth without thy notice; shall I then abandon my heart to vexation and not confide in thy paternal care?

If the Lord be my protector, my sun, my shield, and

my deliverer, I have nothing to fear from heaven nor from earth, nor shall all the powers of hell cause me to tremble.

## NOVEMBER I.

### A HYMN OF PRAISE.

THOU, O Lord, hast created the hosts of heaven, and the blessed spirits which encompass thy august throne. The heavens in their immense extent, and all the magnificence with which thou hast adorned them, are only the tabernacles of those sublime intelligences which know and adore thee.

Thou hast adorned this globe of earth with a thousand beauties which enchant the mind. The sun, which illumines these worlds, fertilizes the earth, and enriches it with so many benefits, is so established by thee that he cannot be moved.

At thy command the moon, the flambeau and ornament of the night, favours us with her mild light. Wherever we look, wherever we go, we see new proofs of thy goodness ; on us thy blessing continually rests.

Springs and unfailing fountains bubble forth in our behalf, and furnish us with limpid and wholesome water. The gentle dew waters and refreshes our meadows. Mountains and vallies, forests and fields, present us with a thousand thousand beauties. The whole earth, which thy hand supports in the immensity of space, is full of thy riches, crowned with thy goodness, and fertilized by thy bounty.

Let us bear without murmuring the afflictions of life ; frequent blessings, and especially the blessed hope of eternal felicity, shall assuage our griefs. The magnificent spectacle of nature shall reanimate us, and the beams of his grace shall dry up our tears.

But who can fathom the depth of thy ways ? In this life good and evil walk side by side ; earthquakes, thunder, tempests, war, contagions, and innumerable maladies disturb the repose of mortals. We shall fall before death ;

he spreads devastation everywhere, and respects no person.

A blast overturns us, and precipitates us into the tomb, and we are reduced into dust. But, everlasting thanks be to God! we expect a new life through the Lord Jesus, who has conquered death, and brought life and immortality to light by his gospel!

## MARINE ANIMALS.

At first it seems difficult to believe that living creatures could be found in the sea. It contains so many different kinds of plants, herbs, trees, and bushes, which so grow and twine together, that this must apparently render the paths of the great deep impassable, as nothing but confusion and disorder seem to reign in that extensive wild. But can there be in the sea living creatures connected with each other? Nothing is more true, how strange soever it may at first sight appear. And it is not some individuals only that the sea contains, but such an innumerable multitude of different kinds, that we are very far from knowing them all, much less can we tell the individuals which belong to each species.

Among this innumerable multitude of animated beings there is no confusion; they may be all easily distinguished, for in the sea, as well as everywhere else, the most perfect order prevails. All these creatures may be ranged in certain classes; they all have their particular nature, food, manner of life, characteristics, and peculiar instincts. In the sea, as well as upon the land, there are gradations, shades, and insensible steps from one species to another. The one begins where the other ends. The stone which is at the highest step of the ladder in the mineral kingdom, is one half of it a plant. The plant which terminates the vegetable kingdom, belongs in part to the animal kingdom; and the beast which connects the human and the brute creation, has a great resemblance to man. So likewise in the sea nature passes gradually from little to great; perfects insensibly the different kinds, and unites all beings by an immense chain, which is not deficient in a single link.

What a prodigious multitude of inhabitants must the sea contain! What a variety is there among them! What a diversity in their forms, instincts, and destination! Some are so small that they can be scarcely perceived; others are so large that we are terrified at their enormous bulk. Some are entirely without ornament, and so like the sea in colour, that it is almost impossible to perceive them in that element. Nature has adorned others with the most vivid and magnificent colours. Some kinds do not multiply much, because if they did, they would devour and destroy all the rest. Others, on the contrary, multiply prodigiously, because they serve for food to men and other animals.

Lord, how numerous are thy works! in wisdom thou hast made them all: the earth is full of thy goodness; so is this great and wide sea, wherein are creatures innumerable, both great and small animals. There go the ships, there are the great whales which thou hast formed to sport therein. These wait all upon thee, that thou mayest give them their meat in due season. *Ps. civ. 24—27.*

## NOVEMBER II.

### THE WISDOM OF GOD IN CONNECTING ALL PARTS OF NATURE.

As all the members of our bodies, taken collectively, form but one whole, constructed and arranged with the utmost wisdom; in like manner the different kinds of natural productions are so many parts out of which the Supreme Wisdom has formed one perfect whole. A little attention only is necessary to convince us that everything in nature is connected so as to form a perfect system. Different kinds of mineral earths manifestly nourish and support the vegetable kingdom, without which animals could not exist. Fire, water, and air are indispensably necessary for the preservation of this terrestrial globe; there is therefore an indissoluble bond between all the beings of which our globe is composed; and philosophers have demonstrated that the globe itself

has a necessary connexion with the sun, the planets, and the whole creation. Now to connect together this infinite multitude of different beings, and to form but one whole out of all these parts, required unbounded wisdom. This alone could connect so many millions of different creatures, and unite them in such a manner that they should subsist in continual relation to each other, and minister to each other's support.

That we may not lose ourselves in this immense ocean of creation, let us only consider our own globe, which is one of the most inconsiderable parts of the universe. The wisdom we discover in it will enable us to judge of what is manifested in the rest of the creation. At present let us reflect only on what is before our eyes. If we examine the animal kingdom in the relations it has to the rest of nature, if we reflect on the wants which are common to all the animals, we cannot but be struck with the admirable harmony which we discover in it. Heat, air, water, and light are absolutely necessary for the preservation of all creatures. But there must be a just proportion of them. Too much or too little would be equally injurious, and make a general chaos of nature. One degree too much in the universal heat would destroy every living creature. For if our earth, taken in the whole, received more heat from the sun, it would necessarily follow that the summer would be hotter in every climate than it is at present. But experience tells us that in all countries the heat is sometimes so great, that were it to be increased a little, either in degree or duration, all the animals must perish, and all the vegetables be burnt up. On the other hand, if we had less heat we should be equally injured, seeing at present the cold is sometimes so intense that many animals are in danger of being frozen to death; and it is not an uncommon thing to see some killed by the severity of the cold. The earth therefore receives that degree of heat from the sun which is proper for all the creatures, and any other degree would be destructive. There is the same just proportion in the air. The ascent of vapours depends chiefly on the weight of the air, and the rain on its lightness. Now if the air could not condense and rarefy itself alternately, and become at one time heavy, at

another time light, we should not have that diversity of temperature which is so necessary for the vegetation of plants, and consequently for the life of animals.

Were the air in general more weighty than it is, it would be more laden with vapours, clouds, and fogs; and through its excessive humidity would be injurious to plants and animals. If on the contrary it were lighter, the vapours could neither ascend nor collect in clouds. It is the same everywhere. Nature observes a just medium in all things; and as all the elements are so arranged as best to secure the preservation of animals, so they are in perfect harmony with all the other parts of nature. The air not only produces those variations of temperature which are so necessary, but it is at the same time the vehicle of sound. It has been appropriated to our ear, and here again a marvellous wisdom is manifested; for if the air were more or less elastic—were more dense or more rare, the ear would suffer by it greatly; and the soft and pleasing voice of man would either resemble claps of thunder, or the hissing of serpents. The air also contributes to the circulation of the blood: it penetrates the very smallest ramifications of the veins; were it more dense, its force would break everything; were it more rare, its action would be too weak. There are a thousand other relations between the air and different beings, and it has all the properties that each requires.

Now if we consider that many thousands of plants and animals have equal need of air, heat, and light; that each of these species is different from the others; that it has its distinct and peculiar characteristics; that it is weaker or stronger than others; and that nevertheless these elements are equally suited to all, and supply their different wants; shall we not acknowledge that an unbounded wisdom, to which nothing is difficult, has established these admirable and harmonious relations among so many different beings? In a word, everything in nature is made in number, weight, and measure, and directed to the accomplishment of determinate ends. Not only the trees which rise so majestically, the plants which have such beautiful forms, the fruitful fields and meadows, the serviceable horse, the flocks which feed us, the

mines which produce so many ornaments and so much riches ; the sea, which garnishes our tables with such exquisite fish, and which conveys navigators from one part of the world to another ; the planets which have such influence on our globe ; not only, I say, those brilliant parts of the creation, but even the mosses, the shell-fish, and the insects, all contribute to the perfection of the whole.

Infinitely powerful Being ! Creator and Preserver of all things ! Can I contemplate these objects without thinking of thee, and admiring thy wisdom ! Without thee—without thy salutary influences, all would be in darkness, confusion, and disorder ; there would be neither connexion, harmony, nor pleasure upon earth.

“Yes, Lord, it is thy wisdom which adorns, enriches, and supports all things. It is thy wisdom which gives life and happiness to the animal creation. Let it ever be the subject of our songs. May we praise thee incessantly, O our God, and sing hymns to thy honour ; for to thee appertain both wisdom and strength.”

### NOVEMBER III.

#### BED.

PERHAPS in summer we have not been so sensible as we ought of the comforts of a bed ; but now that the cold daily increases, we begin to consider this as one of the particular blessings which we receive from the kindness of God. If we were deprived of it in these cold nights, perspiration could not be carried on so well ; our health would be impaired, and our sleep would not be so comfortable and refreshing. On this account bed is a considerable benefit to us. But whence comes that warmth which we feel in it ? We mistake if we suppose it is the bed that warms us ; far from being able to communicate any heat to us, it is from our bodies which it receives its warmth. It only prevents the heat which evaporates from our bodies from being dissipated in the air ; it confines and concentrates it.

We shall be more sensible of this blessing if we con-



sider how many creatures concur to procure a quiet sleep. How many animals must furnish feathers and hair for this purpose ! Supposing that a common bed contains fifty-six pounds of feathers, and that one goose produces about half a pound, the spoils of one hundred and twelve geese will be necessary for one bed ! But it requires many hands and materials besides. Now by such calculations as these, we may better learn the value of God's blessings. Generally we consider the blessings he communicates in a very superficial manner ; but if we examine them in detail, we shall form a different opinion of them than what we commonly do. Let us consider the different parts of which our bed is composed, and we shall be astonished to find that it requires the labour of ten men at least ; that it has cost the lives of as many animals ; that the fields must furnish flax for the sheets and quilts ; sheep, wool for the blankets ; the forests, timber for the bedstead, &c. We see then that a considerable part of the creation is put in motion to afford one refreshing night's rest.

We may make the same reflections on the most common daily blessings we enjoy. Our linen, clothes, shoes, and stockings, meat, drink ; in a word, all the necessities of life, can only be procured for us by the united labour of a multitude of persons. Can we then lie down in our beds without feeling sentiments of gratitude ? At the conclusion of each day we have a thousand other subjects of praise to God ; but had we only this, it would deserve our utmost gratitude. What sweet repose, what comfort do our beds afford us, after the fatigues of the day ! In these cold nights the best warm room would by no means answer so good an end to us as a bed. A warm apartment can give only an unequal heat ; whereas the whole body is equally warmed in bed, and that with the most temperate degree of heat. By means of this we can procure ourselves, at little expense, the warmth, comfort, and rest which are requisite. If then it be a mark of irreligion for a man to sit down to food without giving God thanks, it is more so to lie down in bed without being thankful to him ; seeing the refreshment which our bed affords us is of longer duration, less expensive, and not less necessary for our health. Let us

therefore bless God for this enjoyment, and never forget the excellence of the blessing. We should be the more thankful, when we consider how many of our fellow-creatures either have no beds to rest on, or cannot rest on them. These distressed people highly deserve our pity. How many are exposed to the open air in all the inclemency of the season, travelling either by land or water! How many confined in prisons, or in wretched cabins, who long for rest, and would think themselves the happiest of mortals had they but a small part of the blessings which we enjoy!

It is not unreasonable to suppose that the hundredth part of the inhabitants of a town or city are found in such distressing circumstances as these. What advantages have we over them! How many of our fellow-creatures are obliged to watch the whole night! The soldier at his post, the sailor in his ship, &c. But how many are there, who, though they have beds, cannot find rest on them? In the compass even of a few miles, how many sick persons are there whose pains prevent them from sleeping! And others are kept awake by carking care. Sinners, by remorse of conscience, are deprived of the sweets of sleep; with many other wretched people, whose secret afflictions and poverty, together with their anxiety for the future, do not permit them to take the least repose. Now what is our duty in reference to them? If we have not the ability to supply their wants, and assuage their pains, let them at least share our compassion, and have an interest in our prayers. As often as we seek rest in bed, let us pray for those who are deprived of it, either through sickness, anxiety, poverty, or any other cause of distress. Let us especially remember those who are obliged to lie on the bare ground. Let us think also of our sick and death bed. We shall not always sleep as comfortably as we do at present. Nights may come in which we may water our couch with our tears; and in which the pains of death shall compass us about. But even these shall be followed with a peaceable rest in the grave. If we sleep in the Lord, we shall awake again with new energy, and contemplate the glories of our God. Let us therefore, in the days of our health and prosperity, think of this last bed—our bed of

earth ; and let us live so as to be able to think of it with satisfaction and joy.

## NOVEMBER IV

### REFLECTIONS ON THE PAST SUMMER.

THE fine days are gone ; and except the pleasing recollection of having enjoyed them, they leave us nothing but emblems of frailty. How is the whole face of nature changed ! The rays of the sun fall faintly through the gloomy clouds, on gardens stripped of their flowers, on fields where no traces of crops remain, and on hills where little verdure is to be seen. The air no longer resounds with the melodious singing of birds ; and the gloomy silence which reigns everywhere is only interrupted with the croaking of jackdaws, or the shrill cries of those birds of passage which now take their leave of us in order to seek a warmer climate. The surrounding mountains are deserted ; they are no longer covered with flocks, nor enlivened with the bleating of the sheep : the hot-beds and parterres are laid waste. What a gloomy and dismal aspect does the whole country wear, which was lately so beautiful ! Instead of that lovely verdure, the principal ornament of the fields, they present little to the eye but a pale and dismal yellow. The clouds are laden with cold rain, and the thick mists veil the serenity of the morning.

Such are the prospects which nature now presents ; and who can view them without reflecting on the frailty and inconstancy of all terrestrial things ? The fine days are gone ; just while we were preparing to enjoy them, they are fled away ! But have we a right to murmur and find fault with the dispensations of the Lord ? No, certainly : we should rather recollect these summer days, and the innocent pleasures with which they have been crowned ; and return praise for them to the Ruler of seasons. What sweet sensations have been impressed on our hearts ; with what pure joy have our souls been filled when we contemplated the beauties of nature ; when the mountains and the vallies grew green before our eyes—

when the lark in the luminous clouds, and the night-ingle in the shady thickets, caused their harmonious notes to be heard ; when we respired the sweet perfumes of the flowers ; when the dawn, immediately succeeding the twilight, diffused joy and gladness around ; and when the setting-sun tinged the forests and hills with the most beautiful red. What happy days have we spent in the enjoyment of beauteous nature ! What rich presents have been made to us by the gardens, orchards, and fields ; exclusive of the pleasures which our imagination and senses have received from them ! Can we think of the past months without feeling a sweet emotion, and without praising the Parent of nature, who has crowned the year with his goodness ?

We now live on the gifts of summer and autumn. We have seen with what activity nature laboured in those fine seasons, to accomplish the beneficent views of the Creator in the behalf of man. How many plants and flowers has spring thus produced ! What crops of fruit has summer ripened : and what an abundant harvest has been collected in autumn ! The earth has now fulfilled its design for this year, and is going to repose for a short time. Thus nature is continually employed during the greatest part of the year ; even in her rest she is active, and in silence prepares a new creation. Have we been equally active ? Have we employed our time so as to bring forth fruit ? The husbandman now counts his sheaves ; should we not be able to reckon some virtues, some good works ? Have the pleasures of summer rendered us better and more grateful ? Has a contemplation of nature excited us to lift our hearts to God ? What have our occupations been during the long summer days ? Have they contributed to the glory of God, and the good of our fellow-creatures ? In contemplating the sun, the flowers, and so many delightful objects, have we felt those sentiments which such magnificent scenes are calculated to excite ? Are we conscious that this summer has not, like many others, been lost upon us ?

We are still blest with life ; and can reflect on the spring and summer which are just elapsed. Can all those who have seen the first of May, say as much ?

Alas, many of them before the end of the summer, yea even before it began, have passed from the land of the living into the empire of the dead. It is right, O our God and Preserver, that we should bless thee for our continued existence. But we also shall soon depart; and possibly we have seen our last summer! And what shall become of us, if we be called to give account of the manner in which we have spent the past! Enter not into judgment with us, O God!

## NOVEMBER V

### INCONVENIENCES OF THE NIGHT.

At this season the nights continually increase in length; and it cannot be denied but this arrangement is in some respects disagreeable. For although a part of the night is appropriated to strengthen and refresh us by sleep, this very circumstance points out to us the weakness and frailty of our nature. Hence it is, that at the commencement of the night all our employments are interrupted, not only from the want of light but also from the necessity of repose, and from the animal strength and spirits being exhausted. It is no wonder, therefore, that the hours of the night should appear so long and tedious, especially when we are restless and cannot sleep.

With what impatience does the sick man count the hours, and long for the rising of the sun! Another inconvenience of the night is, that we are exposed to lose our way, and meet with disasters. When the light of the sun is withdrawn, and the shades of night veil the sky, we cannot see where we walk, we are every moment stopped, and make false steps. How many travellers wander in the night time, get into bad roads among briars and thorns, bogs and pits, and by falling over precipices meet with instant death! Besides, during the night we are exposed to attacks, either in our own houses or on a journey, by wicked and perverse men; for the darkness of the night is favourable to all sorts of crimes, encourages the disturbers of the public peace, and

veils their transgressions from the eyes of men. What renders the nights still further inconvenient is, that they are cold ; for when the sun is set, and his rays are withdrawn, one half of the globe is deprived of his vivifying heat, as well as of his light, and this renders the long winter nights very disagreeable. We may add to all this, that night by its regular return presents us continually with a new emblem of death.

There is neither constant night nor day upon the earth ; and although the time of darkness in winter is long, and that even during the summer the regular returns of darkness cause the division of days, it is nevertheless certain that God has given our globe more light than darkness ; an advantage which we enjoy by means of the twilight, and by the light of the moon and stars. Blessed be the Lord for the light of the moon and stars ! Blessed be his name for the light of the sun, and the splendour of noonday ! But more especially may his name be magnified for the light which his Gospel has diffused over the dark night of ignorance, error, and misery ! Some rays from the heavenly world fall upon us and enlighten us in the dark path in which we walked ! Let us remember that in our most obscure nights, in our times of sorrow and distress, we are marching to the region of light and joy. Should it sometimes happen that sleep forsakes us in the midst of the darkness of the night, and that sickness or perplexing cares cause us to reckon the melancholy hours, let us comfort ourselves with this thought, that we are not buried without hope in the darkness of an eternal night, but that we are advancing towards our heavenly country, towards those blessed mansions where there is no night, no alternatives of light and darkness, no sorrow nor anxious care.

Blessed be God that the night of ignorance, darkness, and distress, with which we are encompassed here below, is not an eternal night ? Heaven and an endless glory will soon be the portion of the righteous. Sun and moon, and ye radiant stars which blaze in the firmament, hasten on and finish the race set before you ! Increase your speed, that the time of trial, the revolutions of day and night, of months and years, which are assigned me, may be terminated. May the light of faith enable me

to discover the dawn of that great day when all the nights and darkness which surround me shall end for ever! Morning of eternity, haste thy appearing, that all my hopes may be realized! I long to arrive in those blessed mansions of that permanent city where there is no night; but where an everlasting day shall incessantly perfect our knowledge, our holiness, and consequently our felicity!

#### LINES AND PLANES IN ASTRONOMY.

THE mind of man is ever desirous of obtaining knowledge, and therefore is not satisfied with a superficial acquaintance with things, but pushes its inquiries to the utmost limits of its energy; but being liable to many mistakes, at last, is taught to proceed with caution, and to examine every step of the progress. Mathematicians have for this purpose investigated the most useful properties of quantity in its simple nature, or abstractedly, that is, without including the idea of any real physical being. From the labours of these men our knowledge of natural things has been much increased, many errors have been corrected, and frequently a clear path opened for our advance. Number, lines, planes, and solids are the most familiar objects of mathematics, all of them very useful in astronomy. Especially if we cannot form ready conceptions of lines and planes, we cannot make deep astronomers. It is true, without this, we may find enough in the heavens to excite admiration, and may there clearly see the finger of God. But if he has given us powers to penetrate beyond the mere surface, shall we not employ those powers, that our enlarged minds may glorify him the more?

A straight line is so simple that most men can conceive of it in every variety of position; but even in following this to immeasurable lengths the minds of many become confused: perhaps this arises from attention to other ideas at the same time. Take a straight rod, and hold it in any position; suppose it to be extended both ways, its two extremities are still two points in space, and the rod so produced is still a natural line,

of which the original rod is a part ; if indefinitely produced, it meets the heavens, and may be considered as marking two opposite points in the sky ; it is a diameter of the sphere. Take two fixed stars, and suppose them connected in such a rod, this rod will be a line meeting the surface of the sphere, but not a diameter, unless it pass through the place where we are. The least variety of position of a rod in our hand will cause it to meet the heavens in different points, supposing it produced in each case ; but if we hold two rods precisely parallel, and extend them, they will apparently meet the celestial sphere in the very same point, for the distance between them always appears to decrease as they become longer, till it becomes altogether imperceptible ; and thus it is that the huge bodies of the fixed stars appear as mere points. Hence, if the rod in our hand was directed to a fixed star, and produced to it, and another rod were to pass through the earth's centre, or its opposite surface parallel to this in our hand, it would meet the heavens in the same star, that is, in the same physical point.

Many have found much greater difficulty in conceiving of planes than of lines. May we not assist ourselves thus ? Having put the straight rod in a determinate position, take an inflexible board, or metallic plate, not any way warped or curved on the surface, but quite a plane ; let it be laid on the rod so as to touch it in two points, it will touch it necessarily through its whole length ; now imagine this plane to be extended or drawn out without deviation towards every side of it. The whole is a plane of which the plate is a part ; the extended rod lies wholly in it, and if any number of points be assumed in it they are said to be all in the same plane. Also, if a body move any way, provided it departs not from that plane, it is called the plane of its path or orbit. In like manner, since our plane is the centre of the sphere, this will mark a great circle in the heavens, dividing the whole sphere into two equal parts. If we now imagine the plane to turn on the rod, or line, as on a hinge, in its different positions, it will be considered as a different plane, inclined to the plane which it represented in its first position. In the same manner as of the line, it may be understood, that if a plane parallel to the plate



extended passes through the earth's centre, it would meet the region of the fixed stars in the same circle ; but nearer objects would be cut in different lines by these parallel planes. It is by the help of lines and planes that the positions of the heavenly bodies are accurately ascertained, and the directions of their motion precisely marked. How indulgent is our heavenly Father in favouring us with such means of knowledge, and in giving us minds capable of employing these and other ingenious means of gaining an acquaintance with his works ! But is it right that our dignified minds should indulge an idle curiosity ? Would not this be a base perversion of such excellent powers ? How much more so, then, to employ them purposely to feed the pride of the heart, or to serve any other base purpose ! No, let us not employ our power to cherish any impure passion, or unholy disposition. Let us have in view the glory of God, and the general advantage of mankind. After all we can know, we find we are only on the threshold of knowledge. We find him the more to be admired, and ourselves the more dependant on him. Should we not exclaim, O Lord my God, I arrogate nothing to myself ; I lament I have so often offended thee. Make me grateful that thou hast redeemed me ! May I praise thee for my being, and all my powers ; and to thy endless glory may they be consecrated for ever ! Amen.

## NOVEMBER VI.

### REFLECTIONS UPON WOODS.

Woods form one of the most beautiful pictures which the surface of the earth presents to the eye. It is true that at first sight they are unadorned beauties ; for we see at first only a confused collection of trees, and a dreary solitude. But an enlightened observer, who terms everything beautiful which is good and useful, finds in such sights a thousand things worthy his attention. Let us therefore visit the forests, they will furnish us with many subjects of admiration and gratitude.

Now that the walks in the fields and meadows are not

so pleasant as they were in the summer, the forests are more interesting, and will yield us solid pleasure. For there is no place that invites us more to meditate on the grandeur and beauty of the works of nature than a lonely wood; the pleasing obscurity and the profound silence which reign there, lead us to recollection, and awaken our imagination.

The multitude and variety of trees are the first things which attract our attention. They are not so much distinguished from each other by their height as they are by their manner of growth, their leaves, and their texture. The resinous pine is not remarkable for the beauty of its leaves; they are narrow and pointed; but they last long, like those of the fir; and their verdure during the winter recalls to our memory the beauty of the summer months. The foliage of the lime-tree, the ash, and the beech, is much more beautiful and varied. The verdure of these is admirable; it relieves and strengthens the sight; and the broad indented leaves of some of them form an admirable contrast with the narrow fibrous leaves of others. Their seeds, manner of being propagated, and the use of their fruit, are as yet but imperfectly known. But to what a variety of purposes may the timber of trees be applied! The oak, the growth of which is so slow, and which only begins to put forth its leaves when other trees are adorned with them, furnishes the hardest wood, out of which the joiner, the cabinet-maker, and the carver, know how to form a variety of works which are so durable as even to defy, in some measure, the wastes of time. Lighter wood serves for other purposes; and as it is more plentiful, and grows quicker, it is of more general use.

It is to forest trees we owe our houses, our ships, a part of our fuel, a thousand moveables, and a thousand important articles of furniture. Wood is the principal matter, or most natural pabulum of fire, without which, in many countries, men could neither prepare their food, nor carry on their manufactures. The industry of man has taught him to polish, turn, cut, and carve wood into a multitude of works, as elegant as they are durable. The divine wisdom has distributed forests with more or less abundance over the whole earth. In some countries

they are at a great distance from each other ; in others, they occupy many leagues, and raise their majestic tops to the clouds. A scarcity of woods in some countries is compensated by their abundance in others. Neither the continual use which men make of them, nor the ravages of accidental fires, nor the vast quantities consumed in severe winters, have yet been able to exhaust these rich gifts of nature. In the space of twenty years we see a forest, where we had before discovered some low copse, or a few scattered trees.

Do we not plainly see in all this the power and goodness of our heavenly Father? How superior is his wisdom to ours! If we had assisted at the works of creation, probably we should have found many objections to the production of forests; we should have preferred orchards and fertile fields. But that Being who is infinitely wise has foreseen the necessities of men in all possible circumstances. And it is in those very countries where the cold is most intense, or wood is needed for navigation, that the largest forests are found. From their unequal distribution a considerable branch of commerce results, and new connexions are formed among men. Each of us partakes of the numerous advantages which woods afford to men ; and in creating forests God has designed the particular good which results to each. Blessed be thou, our heavenly Father, who hast condescended to think of us before we felt our necessities, or could represent them to thee! In everything thou hast prevented our wishes, and liberally provided for us! May we answer the end for which we were formed, and for which we have received so many benefits, and pay that tribute of gratitude, love, and praise, which is so justly thy due!

It is not left to man to plant and maintain forests. All other goods must be acquired by labour. The ground must be ploughed, and the seed sown, at the expense of much trouble and toil. But God has reserved the trees of the forests to himself; he has planted, he preserves them; and man has little to do in their cultivation. They grow and multiply independently of his care; they repair their losses continually by new shoots; and there is always enough to supply our necessities. To be

convinced of this we have only to cast our eye upon the seeds of the lime-tree, the maple, and the elm. From these little seeds vast bodies are produced, which rear their heads to the clouds. It is thou alone, O Lord God Almighty, who hast established them, and hast supported them for ages against the efforts of winds and tempests ! It is thou who sendest dew and rain sufficient to make them renew their verdure annually, and to keep up a kind of immortality among them.

The earth which bears the forests does not produce them ; and we might even say that it does not nourish them. The verdure, flowers, and seeds, with which trees are annually covered, and of which they are annually divested, and the sap which is continually dissipated, are losses which would in time exhaust the earth itself if it furnished the matter for them. Of itself it is a dull, heavy, dry, and barren mass, which derives from other quarters the juices and nourishment which it communicates to plants. The principles of their growth do not proceed from the earth ; but the air, without our assistance, furnishes an abundance of water, salt, oil, and fire, and all other matters which are requisite for the growth of trees.

O man ! laden with so many benefits, raise thy heart to that great Being who delights to do thee good. Woods and forests are heralds of his bounty, and thou must be guilty of the greatest ingratitude if thou neglect to acknowledge this benefit, which almost every part of thy house must recall to thy memory.

## NOVEMBER VII.

### THE SENSE OF FEELING IN ANIMALS.

WE may say with truth, that feeling is the universal sense of animals ; it is the basis of all other sensations ; for seeing, hearing, smelling, and tasting cannot exist without contact. But as the touch operates differently in seeing from what it does in hearing, and in hearing from what it does in the other organs of sensation, we may therefore distinguish the sense of feeling, properly

so called, from that universal sensation which we have already noticed. Both are produced through the medium of the nerves. Of these, anatomists reckon twelve principal pair; they are like small cords or threads, and derive their origin from the brain, and are distributed through every part of the human body, even to the very extremities. Wherever there are nerves there is sensation; and wherever the seat of any particular sense is found, there also are nerves which are the general organ of that sense. There are optic nerves for the eyes; auditory nerves for the ears; olfactory nerves for the nose; gustatory nerves for the tongue; besides the nerves which minister to feeling, and which, like that sense, are distributed over the whole body. All these nerves proceed from the spinal marrow, pass through the lateral openings of the vertebræ, and distribute themselves by innumerable ramifications to every part.

The nerves which minister to feeling are found also through the organs of the other senses; for these organs, independently of their own peculiar sensations, must be susceptible of feeling. Hence it is that the eyes, ears, nose, and mouth receive impressions which depend entirely on feeling, and are not produced by their own particular nerves. That sensation is occasioned by the interposition of the nerves is indisputable; for every member feels more strongly in proportion to the number of its nerves; and feeling ceases where either there are no nerves, or the nerves are cut off. Incisions may be made in the fat; bones, nails, and hair may be cut off, without exciting any pain; or if we think we experience any, it is the mere effect of imagination. The bones are encompassed with a nervous membrane, and the nails are attached to places where there is a plexus, or tissue of nerves; and it is only when one of these nerves is irritated that we feel the sense of pain. Therefore we cannot with propriety say, My tooth aches, for as it is a bone it can have no feeling, but the nerve which is attached to it may feel pain when too much irritated.

Let us here admire the wisdom and goodness of God. In thus diffusing the sense of feeling over the whole body, he has evidently had our well-being in view. The other senses are situated where they may best accomplish

their functions ; and serve for the preservation of all the members. Now as it was necessary for the security and welfare of the body that each part might be informed of whatever may be useful or injurious, pleasing or disagreeable to it ; it was also necessary that the sense of feeling should be diffused over the whole body. It is another proof of the Divine wisdom, that several animals should have the sense of feeling in a more exquisite degree than men have, as that delicacy of feeling is necessary for their manner of life ; and compensates them for the privation of some other sense. The horns of the snail, for instance, have the most exquisite sensibility ; the least obstacle causes them to draw them in with the utmost readiness. How delicate also must the feeling of the spider be, when in the midst of that web which it has so ingeniously woven, it can perceive the least motion which the approach of other insects may occasion !

But without dwelling on the sense of feeling in animals, it will sufficiently excite our admiration if we consider this sense as it exists in man. How can the nerves, which appear to be only susceptible of less or more length, breadth, tension, and vibration, transmit to the soul so many different kinds of ideas and sensations ? Can there be such a correspondence between the soul and body that nerves of a certain determinate size, structure, and tension should always produce certain sensations. Has each organ of sense nerves so arranged and adjusted, so analogous to the corpuscles, or small particles of matter which emanate from bodies, that the impressions which they receive from them should be always followed with certain determinate sensations ? It seems, at least, that the pyramidal form of the nervous papillæ, which are the immediate instruments of taste and feeling, gives some probability to this conjecture. But our knowledge is too limited to decide on this point, and we are obliged humbly to acknowledge that this is one of the mysteries of nature which perhaps cannot be fathomed in this life.

Let us give God thanks that with all the other senses which his goodness has bestowed upon us, he has also given us the sense of feeling. Of how many pleasures should we be deprived if our bodies had less sensibility !

We could not then discern fully what would be advantageous to us, nor shun what would prove injurious. How well would it be if our souls had as lively a sense of what is excellent and honest, and as decided a taste for holiness as our bodies have for pleasure ! This moral sense was in the beginning impressed on our souls ; but alas, it is almost obliterated ; and how deplorable must our state be, if it be totally and finally lost ! Great God, preserve us from so great an evil !

### NOVEMBER VIII.

#### A RECOLLECTION OF THE BENEFITS WHICH WE HAVE ENJOYED IN SPRING AND SUMMER.\*

COME, my friends, let us feel and acknowledge the goodness of the Creator. Let us think with gratitude on the time we have spent in the bosom of joy ; while, exempt from inquietude and trouble, renewed nature filled us with delight ; when devotion followed us to the green bowers, and when even the shadow of sorrow disappeared from our habitations ; when, hand in hand, we traversed the flowery paths, everywhere seeking and finding the Creator ; when from the thick bush, whose foliage had invited the aërial songsters, their melodious notes reached our ears, while peace, friendship, and innocent joy abundantly heightened the pleasure. Smiling nature dealt out her flowers with a liberal hand ; we breathed the balsamic odour of roses. The pink and the wallflower perfumed the air around us, and towards the evening of a fine day, the sporting zephyrs wafted us the sweetest exhalations on their airy wings. Then our souls felt a sweet transport ; the opening of our lips was thanksgiving to the Lord, and under the rose-bushes we mingled our voices with the melodious concerts of birds.

Often, when the gentle breeze had fanned the burning air of summer, and the birds felt themselves animated with new vigour ; when the azure clouds of the sky became dissipated, and the ruler of the day promised us

\* This paper is all in verse in the German.

his favours, pleasure lent us wings, and we cheerfully left the noisy abodes of the city to seek the green shades vaulted by nature. There we were undisturbed ; wisdom, piety, and innocent joy accompanied us to the rural retreat, where we went to admire nature. The bushes, shaken with the evening breeze, afforded us a delightful shade, and diffused a refreshing coolness around : and nature drew from unfailing springs the contentment which she pours into hearts that are pure. There, entirely given up to our Creator, to nature, and to reflections on our own happiness, our eyes were bathed in tears of joy.

The songs of gladness which resounded from every part of the forest tuned our hearts to pleasure and gratitude. The joyous bleatings of the full-fed flocks heard at a distance, the melodious notes of the shepherd's pipe, the dull buzzing of the beetle which fluttered among the flowers, and even the hoarse and monotonous croaking of the frogs warming themselves on the banks of the rivulet, all impressed our minds with joy, and gradually elevated our souls to the Creator. There his supreme wisdom was manifested in the water, in the air, in the quadruped, the insect, and the perfume of flowers. A beautiful country, an emblem of that inhabited by our first parents, presented itself to our eyes. At a distance we perceived old and sturdy forests, and hills gilded by the rays of the sun. The pleasing mixture of the most diversified colours ; the rural flowers, the golden crops, the rich green carpet wrought by the hands of nature, the treasures of the meadows, and the sweet aliment of the herds and flocks, which yield us their wholesome milk ; the food of man as yet hidden in the tender ear ; all these were objects sufficient to excite a feeling heart to glorify the Creator, and celebrate his bounty.

There nature spread before us the majesty of her Author. The magnificent universe, we may justly say, is too beautiful to be the abode of inconsiderate, ungrateful man. For him the wings of the wind waft their refreshing breezes ; for him the silver stream murmurs along, when at mid-day he rests from his labours ; for him the corn ripens, and the trees bear their fruit ; all creation ministers unto him, yet he is regardless of it !



But they who love their Maker will discover in the breeze and in the brook, in the field and in the flower, in the spire of grass and in the ear of corn, the traces of his eternal wisdom ; and to such, universal nature is the herald of his power. That God who created the angel, has also given being to the grain of dust. It is by him that the mite lives, and the elephant, the burden of the earth. At the sight of a blade of grass, as well as at the view of the aloe spike, a thinking mind will raise itself to the Creator ; for the sprat, as well as the whale, proclaims the grandeur of the Most High. Examine his works, and answer me : Is he not as great in the breeze as in the tempest ? in the drop as in the ocean ? in the spark as in the starry firmament ? in the worm as in the hippopotamus ? The vast creation is the sanctuary of God ; the world is a temple consecrated to his glory ; and man was appointed to be his priest in nature, and not the destroyer and tyrant of created beings.

## NOVEMBER IX.

### FOREIGN ANIMALS.

EVERY part of the world has animals peculiar to itself. And it is for very wise reasons that the Creator has placed some in one country rather than another. The most remarkable animals of the southern countries are the elephant and the camel. In size they surpass all other quadrupeds. The elephant especially is like an animated mountain, and his bones are like pillars. His head is attached to a very short neck, and is armed with two kinds of weapons, with which, when necessary, he can even tear trees up by the roots. Had his neck been longer, it could not have supported the weight of his head, nor have kept it up. But to make amends for the shortness of the neck, he has a very long trunk. This he uses as a hand to carry his food to his mouth, without being under the necessity of stooping. He can not only move, bend, and turn this in all directions, as we do our fingers, but use it also as an organ of sensation ; and it may be properly said of this animal, that

he has his nose in his hand. His eyes are small in proportion to the size of his body ; but they are bright, and full of fire ; and in them may be seen all his inward sensations and emotions. In his natural state, the elephant, though wild, is neither sanguinary nor ferocious : he is of a gentle disposition, and uses his weapons only in his own defence. If he be not provoked, he does harm to no person ; but he is terrible when irritated : he seizes his adversary with his trunk, jerks him like a stone, and then treads him to death. The elephant eats a hundred pounds of grass in a day ; but his body being of an enormous weight, he bruises and destroys ten times more with his feet than he uses for food. His principal enemy, and often his conqueror, is the rhinoceros, an animal resembling the wild boar, who uses the horn on his nose to tear up the belly of the elephant. It requires but little attention to discover the wisdom of God in the formation of the elephant ; he causes it to be produced in a country abounding with grass ; and he has taken care that it shall not become a burden to the earth by multiplying too fast, for the female goes two years with young, and does not couple with the male till three years after.

The camel is one of the most useful animals of the East. It is admirably adapted to bear the greatest fatigues among dry deserts and burning sands, as it is able to go four or five days without drinking, and requires but little food in proportion to its size. It crops the few plants and shrubs which grow in the desert ; and when it can find none, about two quarts of beans and barley will suffice it for a whole day. Besides the hunch on its back, there is still another singularity in its make. It has two gullets ; one terminates in the stomach, and the other in a kind of bag, which serves it as a reservoir to keep water in. Water continues in it without putrefaction ; and when the animal is thirsty, or has occasion to moisten its dry food, or assist it in ruminating, it throws up a portion of the water even to the œsophagus, which, having moistened the throat, descends afterwards into the stomach. The ordinary load for a camel is from seven to eight hundred pounds weight ; with which it can travel several miles in an hour, and continue for

twelve or fifteen hours each day. The fleshy hoofs of the camel are made for walking in the sands ; whereas the horny hoof of the horse would be hurt or burnt by them.

The most remarkable animals in the northern countries are the elk, the sable, and the reindeer. The first of these animals is large, strong, and well-shaped. His head pretty nearly resembles, in colour, shape, and size, that of the mule. His limbs are long and strong : his hair of a light grey. This animal is simple, stupid, and timid. He finds proper food everywhere, but prefers the bark and young shoots of the willow, birch, and service-tree. He is exceedingly swift ; and his legs being very long, he can pass over a great deal of ground in a short time.

The sable wanders in the forests of Siberia ; and is very much prized on account of its beautiful fur. The hunting of this animal is generally the doleful occupation of the poor wretches who are banished to the deserts.

The reindeer is an animal of a pleasing and elegant shape, nearly resembling the stag. It seeks its own food, which commonly consists of moss, grass, leaves, and buds of trees. The inhabitants of the north derive the greatest advantages from it. They eat its flesh, drink its milk, and, yoking it to a kind of sledge, are drawn by it with incredible swiftness over the ice and snow. All the wealth of the Laplanders consists in their reindeers. The skin furnishes them with clothes, beds, coverings, and tents : in a word, they derive from this animal all the necessaries of life.

What has been said of these foreign animals may give rise to important reflections. How prodigious is the distance between the elephant and mite ! And what a wonderful variety in the outward form of animals, in their shape, their organs, senses, motions, and manner of propagating their species ; nevertheless, every thing is perfectly adapted and proportioned to the manner of life appointed them. But as there are animals in different parts of the world which could not accommodate themselves to the air, climate, food, and temperature of European countries ; so there may be millions of ani-

mals which could not exist on our globe, and which could no more live among us than we could in Saturn or Mercury.

O God! thy empire is unbounded. Thou wouldst realize all kinds of life and all possible happiness; and this plan, so worthy thy goodness, thou hast executed with infinite power and wisdom. May thy name be praised for ever and ever!

## NOVEMBER X.

### VARIETY OF WINDS.

THERE is a great variety of winds. In some places they are constant during the whole year, and always blow in the same direction: in other places they change at particular times, but always according to regular and fixed laws. In the open sea, between the tropics, and some degrees beyond them, there is an easterly wind, which continues the whole year without any considerable variation. To the north of the line, the wind blows towards the north-east, and to the south of the line it blows towards the south-east, more or less, according to the position of the sun. But this should be understood of the wind that prevails in the open sea; for islands and great continents which are in its way may alter its direction, and cause it to become north-east in certain places. In the southern parts of the ocean, the wind is generally westerly. The nearer the coast the more it varies; and it is still more so on land. The constant east wind is chiefly owing to the heat which the sun communicates to our atmosphere. In the Indian Sea there are winds called monsoons, or trade-winds, which blow in the same direction for three or six months together, and then change and blow in the opposite direction for the same length of time. The cause of these winds has not yet been accounted for in a satisfactory manner; but certainly we must look for it in the variations of heat and cold, in the position of the sun, the nature of the soil, the inflammation of meteors, the condensation of the vapours into rain, and other similar circumstances.

There are both seas and countries which have winds and calms peculiar to them. In Egypt, and in the Persian Gulf, there prevails often during the summer a scorching wind, which prevents respiration, and consumes every thing. At the Cape of Good Hope a cloud is often seen which is called the fatal cloud, or ox eye: it is at first very small, but visibly increases, till in a short time a furious tempest proceeds from it, which oversets ships, and plunges them into the depth of the sea.

Variable and constant winds, which have no determined duration or direction, prevail over the greater part of the globe. It is true that certain winds may blow more frequently in one place than in another; but this is not at fixed times: and they begin and end without any kind of rule. They vary in proportion to the different causes which derange the equilibrium of the air. Heat and cold, rain and fair weather, straits, capes, and promontories, may contribute much to interrupt their course, and alter their direction. There are doubtless many other causes of the different modification and alteration of the air which are as yet unknown.

One thing particularly remarkable, and which always happens in almost every place, is that a little before sunrise, when the air is perfectly calm and serene, just at the dawn there is a quick easterly breeze, which begins at the approach of the sun, and continues for some time after he is risen. This undoubtedly proceeds from the air being warmed by the rising sun, and being rarefied, it drives the contiguous air easterly; this necessarily produces an east wind, which ceases afterwards in proportion as the air around us becomes warm. For the same reason the east wind must not only precede the sun in the torrid zone, but also be much stronger than in our regions, because the action of the sun is more moderate with us than in the vicinity of the line. In the torrid zone the wind blows almost constantly from east to west; there a west wind very rarely happens.

We see, then, that the winds are not the effects of chance, to which neither cause nor design can be attributed. In these, as in all other things, the Creator

manifests his wisdom and goodness. He has so arranged every thing, that the wind blows from time to time, and an absolute calm very rarely occurs. He regulates the motion, strength, and duration of the winds, and he prescribes the race which they are to run. Even their variety is very advantageous; when a long drought has caused both plants and animals to droop, a wind from the sea-coast, laden with many vapours, waters the fields and revives nature. When this design is accomplished, a dry wind proceeds from the east, restores serenity to the air, and brings back fair weather. The north wind brings with it a great number of icy particles, and drives away the noxious vapour of the autumnal air. Lastly, to the keen north wind the south wind succeeds, which, coming from southern climates, impregnates the air with a reviving warmth. By these continual variations fertility and salubrity are maintained on the earth.

Who can make these reflections without adoring God? All the elements are in his hand, and his powerful word irritates or appeases them. When he commands, storms and tempests roar; they rush from sea to sea, and from land to land; and at his bidding serenity is again restored. Should we not then be satisfied with our lot, seeing all our concerns are in his hand? Cannot he who directs the winds regulate also my lot? Seeing that all the variations of the winds concur at his command to promote the general welfare of his creatures, cannot he cause every occurrence in life to contribute to my present and eternal welfare?

## NOVEMBER XI.

### THE CHASE.

HUNTING is one of the principal amusements of a certain class of men at this season, but it were to be wished that less importance were attached to it. For the dominion which man has over animals, and the pleasure he takes in subduing them, is frequently mingled with cruelty. Sometimes indeed the death of certain animals is necessary, in order to make that use of them

for which they are designed, or to prevent them from multiplying so as to become injurious; but even then we should kill them in the gentlest manner possible; but unfortunately this law of nature is very little attended to by the majority of sportsmen. Men in this respect show themselves more sanguinary than the most ferocious beasts. Is not the mode of hare and stag-hunting shocking to every feeling heart? Can it be an innocent pleasure to pursue with implacable fury an innocent animal which flies before us in mortal anguish, till at length, worn out with terror and fatigue, it falls groaning, and expires in the most horrible convulsions? Can human nature be unaffected at such a sight? Can man behold this without some compassionate emotion? To purchase pleasure by the death of an innocent creature, is to purchase it too dearly. It is a dangerous pleasure which habituates men to ferocity and barbarity; for it is impossible that the heart of a man passionately fond of hunting, should not sensibly lose the soft feelings of humanity. Such a person soon becomes cruel and sanguinary; he finds no pleasure but in scenes of horror and destruction; and, being accustomed to be insensible towards animals, he soon becomes so toward his fellow-creatures. Hunting does not appear to me to be an occupation which we can reconcile to the great duties we are called to fulfil. Without speaking of the loss of time, a loss in itself of great consequence, it is certain that hunting distracts the mind, and fills the imagination with ideas which are by no means compatible with serious occupations. Gentler amusements are more proper to divert and unbend the mind, than these turbulent pleasures, which almost deprive the soul of the use of reflection.

Hunting must ever appear a suspicious and dangerous employment to every moral and religious man. For ought we not to be afraid of a pleasure which gives place to so many irregularities and sins? How much must the health suffer in such a violent exercise, and in such sudden transitions from heat to cold? What excesses, what cruelties, what oaths, do such persons indulge themselves in! How are the horses, the dogs, and even the men treated! What mischief is there done to corn-fields

and pasture-ground ! Can all these evils be considered only as trifles which deserve no attention, and may be practised without scruple ?

Were we wise, we should seek more pure and innocent pleasures, and surely such may be easily found. We have only to look around us, and we shall everywhere discover pleasing objects well calculated to afford us the greatest satisfaction. Heaven and earth, the arts and sciences, labour, our senses, the conversation of our friends, in a word, every surrounding object invites us to the enjoyment of pure pleasure. Why then should we run after gross and violent pleasures, which never fail to leave disgust and remorse behind them. We have within ourselves an abundant source of enjoyment ; a multitude of intellectual and moral faculties, the cultivation of which may every moment give us some new satisfaction. But it is in this alone that the great science of a Christian and philosopher consists. Such have the art of being happy without much outward appendages or great expense ; and they can always be so without risking their virtue.

## NOVEMBER XII.

### DREAMS.

THE inactivity of our soul during sleep is not so complete as to leave the faculties unemployed. We have ideas and representations, and our imagination is continually at work. This is the case when we dream. However, the soul has but little share in them, except so far as relates to the memory ; and perhaps this faculty belongs rather to the animal than to the rational soul. If we reflect upon our dreams, and examine why they are so irregular and unconnected—why the events which they represent to us are so fantastic, it will be found that this proceeds chiefly from our being more affected by sensations than by perceptions. Our dreams represent to us persons whom we have never seen, or are long since dead : we see them as alive and associate with them things which actually exist. If the soul acted



in dreams as it does when we are awake, a moment would be sufficient to set these unconnected and confused ideas in order. But commonly its attention is confined to the receiving and following the images which present themselves to it. And although these objects appear in the strongest light, yet they are always fantastically associated, and have no regular connexion; for sensations succeed each other without the soul's combining or putting them in order. We have then sensations only, and not notions, for notions can only take place when the soul compares sensations, and operations on the ideas, which it receives through the medium of the senses. Thus dreams are formed in the inferior faculties of the soul; they are not produced by its own energy, and can only appertain to the animal memory.

It is very singular, that in dreams we never imagine we hear, but only see. It is still more remarkable that the images which we see are perfectly like their originals. It seems as if the soul of a painter only could draw such true and regular pictures; nevertheless these designs, however exact they may be, are executed in dreams by persons who have no idea of the art. Beautiful landscapes, which we have never attentively observed, present themselves to us in dreams as true and exact as if done by the most eminent artists.

As to the accidental cause of dreams, by which former sensations are renewed without the assistance of any present and real impression, it ought to be observed, that in a state of profound sleep we never dream, because all our sensations are extinct, all our organs are inaccessible, everything sleeps, the internal as well as the external senses. But the inward sense, which falls first asleep, is the first that wakes, because it is the most lively and active, and may be more easily excited than the outward senses. Sleep is then less perfect and less sound, and this is properly the time for dreams. Former sensations, especially those on which we have not reflected, revive. The internal sense, which through the inactivity of the external senses, cannot employ itself on present impressions, is taken up with, and operates on preceding sensations. It acts in preference on those by which it was most forcibly affected; and hence it is, that the greater

part of our dreams are either excessively frightful or extremely pleasant.

There is another circumstance in dreams worthy our observation—they are the image of the character of the man. From the phantoms which occupy his imagination during the night, we may conclude that he is virtuous or vicious. A cruel man continues to be so even in sleep; and a benevolent man is even then occupied with his mild and benign dispositions. It is however true, that an impure or vicious dream may be occasioned by the state of the body, or by external or accidental circumstances; but our conduct as soon as we awake will prove whether these dreams may be imputed to us or not; we need only attend to the judgment we then form of them. A good man does not consider his dreams with indifference; for if during his sleep his mind deviates from the rules of justice and purity, he is affected for it when he awakes. It is certain that a soul which goes to rest with a lively sense of the favour of God, scarcely ever fails in its dreams to have ideas and representations of heavenly things. A good conscience often comforts a holy man in his sleep, through the blessed knowledge he has of the divine favour.

But sleep is not the only time when fantastic and unconnected objects confuse and disorder our imagination. How many people are there who dream while awake! Some have an extravagant idea of themselves, because fortune or favour has raised them to places of rank. Others make their happiness to consist in empty fame, and feed on the chimerical hope of immortality. Intoxicated with passion and vain hope, they dream that they are happy; but this frivolous and deceitful felicity vanishes like a morning dream. Persons of this character have been well described by the prophet: "They resemble," says he, "the hungry man who dreams that he eats, but he awakes, and his soul is empty; they are like the thirsty man, who dreams that he drinks, but he awakes, and behold he is faint, and his soul hath appetite;" Isai. xxix. 8. Let us never seek our happiness in vain phantoms or deceitful dreams! Let us entreat the Lord to grant us that wisdom which will direct us to aspire after solid and permanent good, after a glory

that fadeth not away, which will occasion no tears of remorse, when at the hour of death we come to reflect on our past life.

## NOVEMBER XIII.

THE UNIVERSE IS CONNECTED TOGETHER, AND EVERY  
PART CONCURS TO THE PRESERVATION AND  
PERFECTION OF THE WHOLE.

EVERYTHING which the beneficent Creator has produced on our globe is admirably connected with another, and contributes to the mutual preservation of the whole. The earth itself, with all its rocks, minerals, and fossils, owes its origin and continuance to the elements. Trees, plants, grass, and mosses; in a word, all vegetables derive their nourishment from the earth, whilst the animals in their turn feed on the productions of the vegetable kingdom. Afterwards all these return to their first principles. The earth nourishes the plant, the plant the insect, the insect the bird, the bird the wild beast; and in its turn the wild beast becomes the prey of the vulture, the vulture of the insect, the insect nourishes the plant, and the plant becomes earth. Even man, who makes use of these things, often becomes their prey in his turn. Such is the circle in which all things here below revolve.

Thus all beings have been created for each other, and nothing for itself alone. Tigers, lynxes, bears, ermines, foxes, and other animals provide us with furs for our covering. Hounds traverse the forests, and pursue the hare and the stag to furnish our tables; and the part which they receive of the prey is very little. The ferret drives the rabbit from its deepest recesses into our hands. The horse, the elephant, and the camel are trained to carry burdens, and the ox to draw the plough. The cow gives us her milk; the sheep, its wool; the reindeer makes the sledge fly over the snow and ice; the swine, the hedgehog, and the mole dig up the earth, that the seeds of plants, being dispersed abroad, may take root the more easily. Even the hawk preys for our table, and

the hen gives us her eggs. The cock awakes us to our work, and the lark amuses us with her songs throughout the day. The warbling of the blackbird is heard from morning to evening, and the melodious accents of the nightingale charm us during the night. The superb plumage of the peacock delights our eyes. Fish come from the depths of the ocean, throng our coasts, and swim in our rivers, to furnish men, birds, and beasts with abundance of nourishment. The silkworm spins, that we may clothe ourselves with its precious web; bees, with indefatigable diligence, collect the honey which we find so delicious. The sea casts multitudes of crabs, oysters, and all sorts of shell-fish on our coasts, for the supply of men and other animals. The lantern-bearer, or great fly of Surinam, shines through the darkness to enlighten the inhabitants of those countries.

If we examine the different occupations and labours of men, we shall find that they also tend to the same end which nature has proposed. The mariner tempts the dangers of the sea, and braves the storm, to bring merchandises which do not belong to him to the place of their destination. The soldier sacrifices his blood for his country and the welfare of his fellow-citizens. The lawyer is only employed in other people's suits. Sovereigns and magistrates, who are at the head of government, consecrate their time and talents to the good of the commonwealth. Parents lay up treasures for their children. The husbandman sows and reaps, yet consumes but little of the produce of his own labour. Thus we live not for ourselves alone; for the divine Author of nature has so ordered it, that all beings should become useful to each other. Let us learn from this what our mutual duties are. The strong should succour the weak. The man of understanding should help others with his advice. The learned should instruct the ignorant. In a word, we should love our neighbour as ourselves, and thus fulfil the designs of the Creator. These reciprocal offices which men owe to each other, have induced them to form societies. That which divided force could not effect is easily accomplished by united energy. No person could build a beautiful edifice, or construct a palace, were he obliged alone to lay the foundation, dig the

cellars, mould and burn the brick, raise the walls, put on the roof, make the windows, decorate the apartments, &c. But all these are easily performed by a number of workmen, who mutually assist each other. Such is the invariable law of nature, that in all arts and sciences nothing of importance can be brought to perfection, without the concurrence of several persons. How many thousands of men are requisite to make one monarch powerful, an empire happy, or a nation famous and flourishing!

How evident is the wisdom of the Creator in all this! That the inhabitants of our globe, and particularly men, might be happy, he has established such connexions and relations among all beings, that the one cannot subsist without the other. Experience must teach us that God has the welfare of his creatures continually in view. The whole world was planned for this purpose; and all its parts concur to the happiness of mankind. Even the things which appear to be of the least importance, and which we scarcely condescend to look at, contribute their part also to render us happy. The very insects, which are so despicable in our eyes, are of great use to us. Thousands of hands are daily employed in our behalf. How many animals lose their lives in order to support ours! And in how many other ways, of which we are ignorant, is nature active in our favour! Kind and indulgent Father! Teach us how to appreciate thy goodness, and our own happiness! And may we henceforth be inspired with the resolution to employ all our strength in thy service, who hast condescended to do so much for us!

## NOVEMBER XIV.

### COMMON SALT.

THE seasoning most extensively used, and what the rich and the poor, the king and the beggar, cannot do without, is common salt. Its savour is so pleasing, and it has such excellent properties for digestion, that we may consider it one of the most precious presents which

nature has bestowed on man. It is given to us in different ways. The inhabitants of the coasts get it from the sea. They dig pits on the shore, which they call salt-pits, and plaster them with clay; the sea flows into them when it is rough; the water detained by the pits evaporates by the heat of the sun, and a great quantity of salt remains at the bottom. In other places nature produces salt springs, fountains, pits, and lakes. To extract the salt, the water is evaporated in large pans or caldrons set over the fire. In some other places, salt is found in solid masses in the mountains. The most famous salt mines are those of Catalonia and Poland. These different kinds of salt are all alike in their chief properties. Experience teaches us, that salt dissolved in the stomach and intestines has a digestive power, prevents putrefaction, and the too great fermentation of the aliments. Hence it is, that it is used internally to restore and promote digestion, to remove crudities from the stomach, to increase the appetite, and to prevent costiveness. It not only dissolves phlegm and the viscosities which hurt digestion and destroy appetite, but it is also a very excellent stimulant for the stomach; the nerves of which it gently irritates, and assists all its operations. Common salt is therefore an excellent digestive, and perhaps the best in the whole economy of nature. Other salts act too powerfully, or are too unpleasant to the taste to be mixed with our food. But common salt acts gently, assists the concoction of all eatables, and prevents that putrefaction to which they are naturally disposed.

Salt is then an especial blessing, which we do not sufficiently esteem, because it is common. Let us pay more attention to it, that we may be excited to that gratitude which so precious a gift requires. Were we to attend more to the daily blessings which we receive from the Lord, what causes should we find to acknowledge and celebrate his goodness! Let us sanctify the use of aliments with such reflections. The greater part of our food would be flat and insipid were we deprived of salt, which greatly increases its flavour and the pleasure we receive from it. But this is the smallest part of its advantages, seeing it is of the utmost consequence to our health, as we have already noticed. What a blessing it

will be, should this meditation lead us to prize this gift of God better than we have yet done! Our hearts will become more and more established in gratitude and obedience, when we accustom ourselves to reflect on the blessings which we receive from the hands of our great Benefactor.

In another point of view salt must be interesting to every observer of the works of nature. The smallest particles of our common salt seem as if they were all exactly cut into a cubic body having eight angles and six sides, like a die : hence it must happen, that most masses of this sort of salt will be terminated by squares, and possess the form of cubes. Here again the hand of the Most High is visible, which has given salt an invariable form, and has cut all its masses after the same model since the beginning of the world. This figure, always regular, and ever the same, is a proof that it owes not its origin to chance or fortuitous motion, but to the will of an Intelligent Being. This thought is too important, too necessary for our peace, to be disregarded : we should seize every opportunity of recollecting it, and endeavour to have it more and more deeply impressed on our minds.

## NOVEMBER XV.

### THE ORIGIN OF FOUNTAINS.

ALL great rivers owe their rise to a number of rivulets; rivulets are formed by brooks and streams; and these owe their origin to springs and fountains. This is incontestable. But whence come the springs? As water, by its gravity, always occupies the lowest parts of the surface of the earth, whence then can the water come which constantly flows from the most elevated regions?

In the first place, it is certain that rain, snow, and in general all the vapours which fall from the air, furnish a great part of the water which flows from springs. It is on this account that fountains and rivers are few in Arabia Deserta, and in some parts of Africa, where it scarcely ever rains. These waters soak into the earth,

and penetrate it till they meet with beds of clay through which they cannot pass. Here they accumulate and form fountains; or else they collect in cavities or grottoes, which afterwards overflow, or the water leaks out from thousands of crevices, great and small, and endeavours to descend to the lowest places, whither its gravity naturally carries it. Thus the water runs incessantly, and forms subterraneous currents, which, uniting with similar ones, form what is termed a vein of water. It is nevertheless very likely, that in certain countries at least, fountains do not owe their origin to the rains only which fall from the atmosphere, for we sometimes find considerable springs and lakes on high mountains, which could not, as far as we can judge, be formed by rain or snow alone. There are many springs which in all seasons give the same quantity of water; and sometimes furnish even more in times of great heat and drought than in moist and rainy seasons. We must therefore conclude, that there may be other causes both for the origin and maintenance of fountains; yet there will be less need for others if we include watery vapours in the notion of rain.

Many springs seem to come from vapours, which, being suspended in the atmosphere, are driven by currents of air towards mountains and elevated places, or by the power of universal attraction are drawn towards these great masses. The atmosphere is, more or less, laden with aqueous vapours, which, being driven and pressed against the hard cold rocks, condense into drops, and thus swell the springs. Yet still we must grant that all springs cannot owe their rise to the above causes; for would not the Danube and Rhine, and other rivers which come from high mountains, be dried up in winter, when these enormous masses are converted into snow and ice? Therefore caverns which communicate with the sea and with lakes, may contribute something to the origin of fountains. There are, doubtless, vast cavities in the earth supplied with water by rains, melted snow, and the like.

The sea-water, having gone by subterraneous canals into these great cavities, rises in vapours through a multitude of chinks, and forms drops, which, falling down by



their own gravity, often find another path ; because water cannot always penetrate where vapours do. Perhaps also the sea-water, especially in countries contiguous to the ocean, is filtered through beds of earth, by which certain springs are produced. These springs have generally a taste similar to the water to which they owe their origin. But the springs which are found on the tops of mountains cannot owe their rise to this cause ; for the sea-water cannot rise so high ; and supposing it could, the springs would be neither sweet nor potable.

All the causes which we have already mentioned contribute more or less to the formation of fountains ; but there may be other causes which are still unknown. It is true, that nature is ever simple in her operations, but that simplicity does not consist in employing only one cause for each particular effect ; it consists in using the fewest causes possible, which do not prevent the presence of a number of auxiliary causes, that may concur to produce the effect which nature has proposed.

But though this may be otherwise, and though the origin of fountains were yet more dubious and obscure than it really is, we must still acknowledge God as the Creator and Preserver of those salutary springs. "God speaks, and the fountains spring from the bosom of the mountains ; springs become rivulets ; and rivulets swell in great rivers, which carry with them abundance and fertility wherever they go. The inhabitants of the country quench their thirst at them, and seek the cool refreshing shade of the woods through which they run. They murmur through the forests, and the wild beasts drink of their waters and rejoice in them." It is God, therefore, who causes these beneficent fountains to spring from the high places of the earth ; sometimes they glide and wind among the mountains, at other times they precipitate themselves in cataracts from lofty eminences, being increased by atmospheric vapours, or the union of different streams. By this wise arrangement, God maintains in the kingdom of nature that continual circulation of brooks, rivulets, and rivers, which contributes to the fertility of the earth, the salubrity of our dwellings, and the draining of waters, whose too great abundance might become injurious.

## NOVEMBER XVI.

## HUMAN HAIR.

LET us examine the hair which covers our heads, its wonderful structure, and its various uses, and we shall find that it is not only highly worthy of our attention, but that very sensible traces of the power and wisdom of our Creator are easily discernible in it.

Every complete hair appears to the naked eye an oblong slender filament, with a knot or bulb at the root, which is generally thicker and always more transparent than the rest. The filament is the body of the hair, and the bulb is its root. The largest hairs have their root, and even a part of the body, inclosed in a small vessel or capsule, formed by a thin membrane. The size of this sheath is in proportion to the size of the root; but the sheath is always a little wider, that the root may not be too much compressed. In such a sheath, the root of the hair is always found. The root has two parts; the one external, the other internal. The outward part is a pellicle composed of little laminæ: the inward is a glutinous fluid in which some fibres are united; this is the marrow of the root. From the outward part of the root, there grow in general five, very rarely six, little white threads, exceedingly fine, transparent, hard, and often twice as long as the root. Besides these filaments, we see other little bulbs rising here and there, but they are viscous, and easily dissolved by heat. The main body of the hair springs from the interior part of the bulb; it is composed of three parts; the exterior sheath, the interior tubes, and the marrow.

When the hair comes to the pore of the skin through which it is to pass, it is strongly enveloped in the pellicle of the root, which then forms a very small tube. The hair pushes the cuticle before it which serves as a sheath to protect it in the beginning, while it is still soft and tender. The rest of the sheath or covering of the whole hair is of a particular substance; it is transparent, and

especially so at the point. In young hair this coat is very soft, but it afterwards becomes so hard and elastic, that it shrinks back with some noise when it is cut. This sheath or coat preserves the hair a long time. Just under the coat there are many little fibres which extend along the hair from the root to the point. They are united among themselves, and with the sheath which is their common covering, by several elastic filaments; and this bundle of fibres forms a tube filled with two substances, the one fluid, the other solid, which together constitute the marrow of the hair.

An attentive observer of the works of God will acknowledge the Divine wisdom in the admirable structure of a hair, as well as in the other parts of the human body. Thus, from the crown of the head to the sole of the foot, there is nothing in man which does not proclaim the perfections of the Creator. Even those parts which seem of least importance, and which might be given up without inconvenience, are nevertheless of great importance, if they be considered in their connexion with the other members of our bodies, or in their wonderful structure and use. This may be asserted particularly in regard to the hair. How many are there who consider it an object worthy of no attention, and who never think they can discover any traces of the wisdom and goodness of God in it! But, besides that in general there is no part of our body without its particular appointment and use, it is very easy to discern the wise purposes for which the hair has been given us.

And first, it is evident that it contributes much to the beauty and ornament of the face. But this is probably its least use. The hair manifestly defends the head, and preserves it from cold and damp; and keeps the brain in its natural state of warmth. It certainly promotes a gentle and insensible evacuation of some humour from the body, helps perspiration, and discharges from the head and other parts those superfluous humours, which would otherwise accumulate there. The hair may answer several other purposes which are as yet unknown to us. But it is sufficient to know some of the purposes which God has designed to accomplish by it. A proper consideration of these must excite us to ac-

knowledge and adore the power, wisdom, and goodness of our great Creator.

## NOVEMBER XVII.

### THE SYSTEM OF THE WORLD.

HITHERTO we have been considering the earth, which is but a point in comparison of the system of the universe. Let us now raise our thoughts to innumerable worlds, at the sight of which this point which we and millions of other creatures inhabit will be eclipsed, and appear as nothing. Let us examine, meditate, and adore.

The sun, which gives life to all, is nearly in the centre of the system called the solar system ; and, changing his place only a little about the centre of the system, turns round its own axis from west to east in about 26 days. Round the sun, in oblong or ecliptic orbits, all the planets move, from Mercury to the Georgium Sidus, or planet Herschel.

Mercury, who is the nearest to the sun of all the planets, performs his revolution in 87 days, 23 hours, and 25 minutes ; but by reason of his nearness to the sun, he is generally buried in his rays, and therefore seldom visible.

Venus describes a greater ellipsis, and finishes her revolution in 224 days, 16 hours, and 49 minutes.

The earth performs her revolution in 365 days, 5 hours, and 49 minutes, what we commonly term a year ; and the moon finishes hers in the same space of time.

Mars finishes his course in 686 days, 23 hours, and 30 minutes.

Jupiter and his four moons, in about 4332 days and 8 hours ; nearly twelve of our years.

Saturn, with his seven moons or satellites, employs 10,761 days and 14 hours, in running his immense circuit ; a space of time answering nearly to thirty of our years.

Last of all comes the planet Herschel or Georgium Sidus, with his six moons, which, as far as our discoveries

have reached, is the most distant in the solar system ; he performs his revolution in 30,445 days, upwards of eighty of our years.

But is even this immense circuit the boundary of the universe? No, certainly ; far beyond the orbit of Herschel is the region of the fixed stars, the nearest of which is at least 400,000 times further from the earth than the earth is from the sun ; although his mean distance from us is not less than 95,000,000 of miles, or 23,799 semi-diameters of the earth ! And how many globes may there be in the vast space which separates Herschel from the fixed stars, which we cannot discover !

But is it possible that the sun, which appears to traverse the half of the sky in twelve hours, should nevertheless be a fixed point in the centre of the orbits of the planets? Do we not see it in the morning in the east, and in the evening in the west? And can the earth move continually about the sun without our perceiving it?

This objection, founded on the illusion of our senses, is really of no weight. Do we perceive the motion of the boat when we are gliding down a river? And when we are in a boat or in a carriage, does not every surrounding object seem to move and pass in a contrary direction to that in which we are going, though they are all fixed and immoveable? However our senses may deceive us in this respect, our reason is obliged to acknowledge the truth and wisdom of that system which supposes the revolution of the earth. Nature acts always by the shortest, easiest, and most simple ways. By the motion of the earth round the sun, we can account for the different appearances of the planets, their periodical rotations, their being stationary, and their direct and retrograde motions. And is it not much more natural and easy that the earth should turn round its own axis in twenty-four hours, than that the sun, the planets, and the whole starry heavens should be carried round the earth in that space of time? An incontestable proof that the sun is in the centre of the system, and not the earth, is, that the motions and distances of the planets have respect to the sun, and not to the earth. And

were we to suppose the contrary, what would become of the harmony and perfect conformity which prevail in all the works of the Creator? But according to our hypothesis, every plant has the same kind of motion which we attribute to the earth.

These reflections on the system of the universe are exceedingly proper to fill our minds with the most sublime ideas of our adorable Creator, and to give us a lively sense of our own littleness. With what pleasure does our mind pass from one idea to another, till it is lost in the contemplation of these sublime objects! With what emotions of astonishment and veneration do we perceive the grandeur of our God! It is true, that an exact and perfect knowledge of the system of the world cannot be attained by our limited understanding; but we know enough of it to be convinced that the whole is arranged with infinite wisdom and goodness, and that no system can be imagined more beautiful, more worthy of the infinite Being, or more advantageous to the inhabitants of the different globes.

## NOVEMBER XVIII.

### LOBSTERS.

THOUGH lobsters were of no use to us as food, they would nevertheless be worthy our attention. The females of these crustaceous animals have a few weeks ago undergone a great change. They have cast off their old coverings, and clothed themselves with new shells. This may be termed their moulting. In thus changing their covering they increase in size, and this mode of growth is common to all crustaceous insects; they increase in size as often as they cast off their old coverings, and this operation is very painful. At the time they change their shell, they change their stomach and intestines also; indeed, they seem to feed upon their former stomach, which wastes by degrees, so that the animal appears to nourish itself with those parts of its body which served it before for digestion. The little white round stones, improperly called crab's-eyes, begin to be formed

when the stomach is destroyed, and are afterwards inclosed in the new one, where they gradually diminish, till at last they wholly disappear. There is reason to believe that the animal uses them as a remedy for the disorders of its stomach; or, probably, they are the receptacle for the matter which is employed in the formation of the new shell.

Except at the time of casting their shells, these animals keep at the bottom of the water, a little distance from the shore. In winter they prefer deep water; but they come to the shore in summer, if the want of food does not oblige them to go deeper into the sea. That they may easily seize their prey, nature has given them several arms and legs. Some of their claws are often as large as their head and body together. What is most remarkable is, that they have the faculty of re-producing their claws and horns when they have been bruised or broken. They can even rid themselves of them when they are inconvenient. They perform this operation in any posture; but they effect it more easily when turned on their back; and the shell is broken with strong iron pincers, and the flesh bruised at the third or fourth joint of the claw. Immediately after the wound the animal is convulsed; the pain causes it to shake its limb every way; and shortly the wounded limb falls off from the body, and a gelatinous humour oozes out and staunches the blood; when this is taken away the animal bleeds to death. This substance envelopes what may be termed the bud of the new limb, which appears at first only as an excrescence, or small cone. By degrees this cone lengthens, assumes the form of a limb, and becomes as complete as the old one.

The manner in which these animals multiply is not less extraordinary. The male carries the prolific substance in an extremely long thread. What principally distinguishes it is a double hook under the tail, which is not found in the female. These animals grow pregnant about autumn; if a female be at that time opened, red clots may be perceived, which are the evidences of impregnation. They gradually disappear; and under the tail, where the female has many little fibres, a multitude of little round eggs may be seen, exactly resembling

those in the roe of a herring. The first eggs appear in December, and are more than a hundred. They grow large in proportion to the increasing warmth; and before St. John's-day, we find little living lobsters among the eggs about the size of an ant, which continue attached to the fibres under the mother's tail, and are there fostered till all the eggs are hatched. At length they disengage themselves from these fibres, and then cling to those of trees or plants near the shore, and there continue till they are strong enough to commit themselves to the deep.

The lobster is certainly one of the most extraordinary creatures in the world. An animal whose skin is stone, which it casts off every year, to cover itself with new armour. An animal whose flesh is in its tail and feet; whose hair is within its breast; whose stomach is in its head, and which is changed every year for a new one; the very first office of which is to digest the old one! An animal which carries its eggs within its body before they are impregnated, but as soon as this takes place, carries them without under its tail; and which multiplies its kind with a double organ of generation! An animal with two stones in its stomach, which are engendered and grow there, and with which it feeds itself till they are consumed! An animal which can cast off its limbs at pleasure when they are troublesome, and replace them with others! And, lastly, an animal whose eyes are placed on long moveable horns! So singular a creature will long remain a mystery to the human mind. It furnishes us, however, with new motives to acknowledge and adore the power and wisdom of the Creator.

## NOVEMBER XIX.

### THE CONVENIENT AND ADVANTAGEOUS SITUATION OF ALL THE PARTS OF THE HUMAN BODY.

IF we examine our bodies with due attention, we cannot but observe that all the parts of which it is composed are so situated as to be most convenient and best adapted to their various uses. It belonged to the Creator



to arrange them as he thought proper, and his wisdom has assigned to each member its proper place; and in forming our bodies he has taken care, not only to provide for its wants and conveniences, but also for its beauty and ornament.

In the first place, with regard to our wants; it is manifest that all the parts of our body are situated in the most advantageous manner. Our body is a machine which is to move of itself by the powers given it, without receiving any impulse from any exterior force. It is necessary it should speedily and with facility perform the will of the mind. All the bones are joined together; but that we might make use of our limbs without difficulty, stretch out or bend the arm, stoop or erect ourselves as we please, the bones are divided into many articulations, and each is rounded at the end, and inserted in the spheric cavity of another, where it moves with ease, because it is covered with a smooth polished cartilage, and moistened with an unctuous humour, which smears the cartilages, and prevents the bad effects of friction. What is most remarkable in this is, that these bones are so firmly set in that they do not slip out, nor separate from each other, although the feet be obliged to carry so great a burden, and the hands to lift sometimes more than one hundred pounds' weight!

In the arrangement and disposition of the different parts of our body, God has provided also for our convenience. The volitions and determinations of the soul may be executed without obstacle or difficulty by the organs of the body. By means of the senses it is speedily informed of whatever concerns it, and the different members of the body directly obey its orders. The eye, which must watch over the whole body, is situated in the most elevated part; it can turn itself easily on all sides, and observe whatever passes. The ears are also situated in the highest place, at each side of the head; and stand open day and night, to inform the soul of the least noise, and to communicate to it all the impressions of sound. As the food must pass through the mouth to the stomach, the organ of smelling is placed immediately above it, to watch like the eye, that nothing corrupted or improper may be received by it. As to the

sense of feeling, it has not its residence in any particular place, but is dispersed over all parts of the body, that all may thereby distinguish pleasure from pain, and things injurious from things profitable. The arms, which are the servants which the soul employs to execute the greater part of its desires, are placed near the breast, where the body has most strength; and without being at too great a distance from the lower parts, are situated in the most convenient manner for all sorts of work and exercise, and for the defence of the head and the other members.

Finally, the Creator, in the formation of our body, has designed also to attend to its beauty. This consists in the visible harmony and exact proportion of the members, and in the pleasing mixture of the colours of a fine and delicately formed skin. Thus we see that those parts of our bodies which are double, as the eyes, ears, arms, legs, &c., are placed, one on each side, at an equal height, the right exactly answering the left; whereas those which are single, as the forehead, nose, the mouth, and the chin, are placed in the middle. This proportion appears in the great as well as in the small. The length of the sole of the foot is the sixth part of the height of the whole body, as the length of the face is the tenth, and the cubit the fourth part. In children the head is larger than it should be, in proportion to the rest; the reason is, that the head being the principal part of the body, and the seat of the senses, it should come sooner to perfection than the other parts; and the more so, as being entirely composed of bones, it could not extend so much as the fleshy members, which it must otherwise have done; for we observe, that in infancy all the members grow at once, and that they extend according to the most exact proportions in length, in breadth, and in thickness; and thus are in continual harmony with the size of the whole body.

Admire, O man, the perfection and beauty of thy body, the connexion and admirable harmony of all its parts. Each member is connected with others, yet they never embarrass nor impede one another in the performance of their different functions. They are situated in the most convenient places, that they may the more

readily accomplish their offices, and lend each other mutual assistance. All the organs are so many springs in this admirable machine. They correspond to each other, and act in concert to fulfil the different purposes for which they were designed. Take heed not to destroy this curiously contrived machine, nor to deform it by irregularity and excess. Do not dishonour it by base and shameful passions. Act so that thy body may be always a monument of the wisdom and goodness of God. But especially take heed that thy soul, which has been degraded by sin, be re-established in its primitive beauty and holiness by the mercy of thy Redeemer. It is by this alone that thou canst be compensated for the change thy body must undergo when it shall return to the dust out of which it has been formed.

## NOVEMBER XX.

### ORDER AND REGULARITY OF NATURE.

IN contemplating the world, we discover everywhere traces of a Supreme Intelligence, who ordained every thing, who has foreseen the effects which should result from the energy he has impressed on nature, and who has counted, weighed, and measured all, according to his own designs, with infinite and unerring wisdom.

Thus the universe, once formed, may always continue, and constantly fulfil its destination, without the necessity of changing anything in the primitive laws once established. The contrary is often the case with the works of men. The most skilfully constructed machines soon cease to answer the intended purpose ; they require continual repairs, and are soon worn out and unfit for use. The principle of these derangements and irregularities is found in their primitive construction ; for there is no artist, how eminent soever he may be, who can foresee all the changes which his work may undergo, or be able to provide against them.

The corporeal world is also a machine, but its component parts and their uses are innumerable. It is divided into many luminous and opaque globes, which serve for

habitations to an infinite multitude of living creatures of all kinds. The opaque globes revolve round the luminous ones in their prescribed orbits and limited times, and receive from them light and heat, day and night, seasons and different degrees of temperature, nourishment and growth, according to the nature and necessities of their different inhabitants. The position of the planets, and their mutual gravitation, are so diversified, that it seems almost impossible to determine beforehand the times in which they will return to the point whence they departed, and begin anew their periodical course. And notwithstanding the variety of phenomena which these globes present to us, and the astonishing multiplicity of their motions, it has never happened, in the course of a thousand years, that these enormous masses have ever struck against or interrupted each other in their revolutions. All the planets perform their revolutions in the times prescribed to them. They have always preserved their order and their respective distances, and have never got nearer to the sun. Their respective forces are still exactly balanced, and stand in the same relations to each other. The fixed stars are the same to-day they were a thousand years ago. The distances, projectile forces, right ascensions, declinations, parallaxes, and direction of all the heavenly bodies are still the same. The sun also is still at the same height; the days and nights, the years and seasons, are just now what they were formerly. An incontestable proof, that in the first arrangement of the heavenly bodies, in the proportion, laws, and relations of their respective forces, and in the rapidity of their course, the wise Author of nature has foreseen and determined the future state of the world, and all its component parts, to the utmost duration of time.

The same may be said of our earth, which is annually subject to different revolutions and changes of temperature. For although it seems at first sight as if fine weather, cold, heat, dew, rain, snow, hail, lightning, tempests, and all sorts of winds, varied indifferently, and were dispensed by chance; that it is by mere accident that water overflows the land in any particular place, altering its surface by changing solid ground into lakes

and marshes ; that in other places we see continents where seas were formerly ; that mountains are formed while others moulder away ; and that rivers are either dried up or turned out of their former beds ; nevertheless it is certain, that each modification of our earth has its sufficient cause in the preceding modification ; this, in that which preceded it ; and the whole, in that which was established at the creation of the world. But nothing is better calculated to make us sensible of our ignorance of particular natural events, and their connexion with the future, than that variety which we observe in the temperature of the air ; a variety which has so much influence on the appearance and fertility of our globe. In vain we multiply meteorological observations, for it is impossible to deduce from them fixed rules and consequences for the future ; for we never yet have seen one year perfectly similar to another. Yet we are well convinced that these continual variations, and that apparent confusion of elements, do not essentially change our globe, alter its figure, destroy its equilibrium, nor render it uninhabitable ; but that they are, on the contrary, the true means of preserving annual order, fertility, and abundance. Since, therefore, every present modification is founded on a preceding one, it is manifest that the elements have not been formed and combined by blind chance, but that from the beginning an eternal wisdom has produced, combined, and measured the elements, appreciated their powers, and determined their effects, till the conclusion of time.

Thus the whole is not composed of disunited or ill-connected materials, or of parts which have neither relation to or connexion with each other ; it is a regular and perfect whole, the structure and arrangement of which is the work of a Supreme Intelligence. If we behold in the world a multitude of beings which have the same nature and destination that we have, and are united by a multitude of relations ; if we discover genera and species more numerous still of other creatures, which are also more or less mutually connected ; if we allow that by the mixture and action of elements all these animated beings are supported, and receive all that their nature requires ; if, afterwards, we carry our thoughts

further, and consider the relations there are between our earth and the heavenly bodies, the constant regularity of their motions, the conformity, concord, and admirable harmony which are found among all these globes that are placed within our notice, we shall be more and more filled with astonishment at the sight of the magnificence, order, and beauty of nature ; and more deeply convinced of the infinite wisdom of the Creator. But all that we know at present of the order and harmony of the corporeal world, is but a small ray of that eternal light which we hope for ; and in the enjoyment of which that divine wisdom, which is now in so many respects impenetrable to us, shall be manifested to us with infinite splendour.

## NOVEMBER XXI.

### WINTER IN THE NORTHERN COUNTRIES.

THE time is now approaching which excites the discontent of so many people. The severe season of winter appears to them to contradict the plan of the Ruler of the universe, which in all other respects is so wise and beneficent. The rich complain that nature is become gloomy and dismal ; and the poor, whose poverty and wants increase in this season, groan and murmur. Yet let those ungrateful people magnify as they please the inconveniences and distresses of winter, they shall be obliged to acknowledge, when they compare their lot with that of other countries, how great God's goodness is toward them in this respect. For in a great part of the northern countries there is neither spring nor autumn, and the heat is as insufferable in summer as the cold is in winter ; the violence of the latter is such that spirits of wine freezes in the thermometer. When the door of a warmed chamber is opened, the external air which enters converts all the vapours within into snow, so that the place is filled with thick white vapours. If a person go out of the house, he is almost suffocated, and the air seems to tear the lungs. All appears in a state of death, no person daring to quit his apartments. Sometimes the

cold becomes so intense, and that suddenly, that if a person cannot make a timely escape he is in danger of losing an arm, a leg, or even life itself. The fall of the snow is still more dangerous ; the wind drives it with so much violence that a person cannot possibly find his path ; the trees and bushes are covered with it, people's eyes blinded, and at every step the traveller is in danger of falling into a new precipice. In summer, the day lasts for three months ; and during the same space a perpetual night reigns in winter.

What would they say, who complain of the cold in our climates, were they obliged to live in the countries above described ? It is plain that we do not know our own advantages, or a very little reflection would suffice to show us how contented we should be with our lot. However gloomy or severe our winter days may be, they are quite supportable by people in general ; and if there be some who cannot bear them, it is chiefly owing to their effeminacy and self-indulgence.

But why has the Creator appointed so many thousands of people to dwell in regions where nature fills them with terror for a great part of the year ? Why has he not made these people as comfortable as we are ? Foolish questions ! We are mistaken if we suppose that the inhabitants of the North Pole are unhappy, through the length and severity of their winter. Though poor, yet being exempt through their simplicity from all desires not easy to be satisfied, these people live contented among the icy rocks by which they are encompassed, without knowing the blessings which the inhabitants of southern climes consider as an essential part of their felicity. If the barrenness of their soil prevent their fields from bringing forth such a variety of fruits, plants, &c., as ours produce, the sea is so much the more bountiful in its gifts to them. Their mode of life inures them to cold, and enables them to defy the tempests ; and as to particular resources, without which they could not support the rigour of the climate, nature provides them in abundance. Their deserts are stocked with wild beasts, the fur of which protects them against the cold. Their reindeer supplies them with food, drink, garments, beds, and tents ; this supplies most of their

wants ; and the animal that thus provides for them is supported with very little expense. When the sun does not rise with them, and they are surrounded with darkness, nature herself lights a torch for them, and the *Aurora Borealis* illuminates their nights. Possibly these people consider their own country as the most extensive and happiest in the world, and pity our lot as much as we commiserate theirs.

Thus each climate has its advantages and inconveniences, which are generally so well balanced, that it is difficult to say upon the whole which deserves the preference. Considered in this point of view, there is no country on the earth, whether the sun dart his rays on it in a perpendicular or an oblique direction, or whether covered with eternal snow or otherwise, that can be said to enjoy more advantages than any other. In one place the conveniences of life are more numerous ; in another, that variety of blessings is absolutely wanting ; but those who have not this variety are subject to fewer temptations, carking cares, or bitter remorse ; in a word, they are ignorant of a multitude of obstacles to happiness, and this doubtless compensates for the want of a number of pleasures. We know with certainty, that Providence has dealt out to each country what was necessary for the support and comfort of its inhabitants. Everything is adapted to the nature of the climate, and God provides, by the wisest means, for the wants of his creatures.

## NOVEMBER XXII.

### TRANSFORMATIONS IN NATURE.

THE transformations which take place in nature are numerous ; or rather, everything is metamorphosed in the natural world. The form of objects varies continually ; certain bodies pass successively through the animal, vegetable, and mineral kingdom ; and there are some compound substances which gradually become minerals, plants, insects, reptiles ; fish, birds, beasts, and men. Millions of bodies are annually turned into dust. Where



are the flowers which, during the spring and summer, adorned our fields, gardens, and meadows? One species appears, withers, and gives place to another. The flowers of March, and the modest violet, after having announced the approaching spring, have disappeared, that we might have room to admire the tulip and the rose. In their places others spring up, till all the flowers have fulfilled their design. It is exactly the same with respect to men. One generation comes, and another goes. Thousands of human bodies return annually to that dust from which they were taken; but from the redissolved bodies, new and more beautiful ones are formed. The salts and oils of which they were composed dissolve in the earth; the more subtile parts are elevated in the atmosphere by the heat of the sun, are there mingled with other matters, and, being variously dispersed by the winds, fall down in dew and rain, sometimes on one place, and sometimes on another. As to the more gross parts, they unite with the earth; the grass which is nourished by this grows into long spires; thus, the flesh of man becomes grass, and feeds the flocks, whose wholesome milk and flesh are afterwards converted into our own substance.

These continual transformations, which take place in nature, are a sufficient proof that the Creator has determined that nothing shall be lost, and that nothing is useless. The dust on flowers, which is employed in the fecundation of plants, is but a very small portion of what each flower contains; but what appears superfluous is not lost; the wisdom of God has formed the bees, who make use of it for their honey. The earth gives us daily new gifts; and it would be finally exhausted if what it gives were not by some means rendered back again. All organized bodies become decomposed, and are at last converted into earth. During this dissolution the volatile parts are raised into the atmosphere, and dispersed everywhere. Thus the remains of animals are scattered through the air, as well as through the earth and water; and perhaps the parts which rise into the atmosphere are by far the least numerous. All those particles, dispersed hither and thither, speedily reunite in new organic bodies, which, in their turn, shall undergo the same transmutations. And this circulation, these

continual metamorphoses, which began when the world was created, shall terminate only when it is destroyed.

But the most remarkable transformation, or at least that in which we are most interested, is what concerns ourselves. We know that our bodies have not been originally, and will not hereafter be, composed of the same number of particles as at present. The body which we had in our mother's womb was extremely little ; it was larger when we came into the world, and since that time it has increased to fifteen or twenty times that size ; consequently, blood, flesh, and other foreign substances, drawn from the animal and vegetable kingdoms, which did not belong to our bodies, have been since assimilated to them, and become a part of themselves. The need we have of daily food proves that there is a continual waste of the particles of which our bodies are composed, and that this waste must be repaired by aliments. Many particles evaporate imperceptibly ; for it appears, by very correct experiments made by an eminent physician on himself, that of eight pounds of food which are necessary for the support of a healthy man, only one fiftieth part is converted into his substance, and all the rest is disposed of by perspiration, and other excretions. From this it may be inferred, that in ten years few of the particles of which we are now composed will remain. And finally, when our bodies shall have gone through several changes, they shall be transformed into dust, till, at the day of the resurrection, they shall undergo that blessed and last revolution, which shall place them in an unalterable and eternal state.

How should we rejoice at this future state, where we shall be free from all the changes which we experience here below ! Let us look with serenity on the daily revolutions to which all earthly things are subject, and which are necessary in the present state. By acting thus, we shall draw nearer to perfection. May we not rejoice in hope of this grand revolution ? When the earth shall have undergone its last and great change, may we be introduced into the new heavens and the new earth, where even the shadow of change shall never exist !

## NOVEMBER XXIII.

## THE GREATNESS OF GOD DISCERNIBLE IN LITTLE THINGS.

HE who delights to contemplate the works of God, will not only discover his hand in those immense globes which compose the system of the universe, but also in the little worlds of insects, plants, and metals. He will search for and adore the wisdom of God as well in the spider's web, as in that power of gravitation which attracts the earth towards the sun. These researches are at present the easier, as microscopes have discovered to us new scenes and new worlds, in which we behold, in miniature, whatever may excite our admiration. They who have not the opportunity of using these machines will read, at least with pleasure, the following remarks on microscopic objects.

Let us, in the first place, observe the inanimate world. Behold those mosses and little plants which God has produced in such great abundance. Of what extremely small particles and fine threads are these plants composed! What a variety in their forms and shapes! Who can enumerate all their genera, and all their species? Think on the innumerable multitude of small particles of which every body is composed, and which may be detached from it. If a hexagon of an inch square contain a hundred millions of visible parts, who can calculate all the particles which compose a mountain! If millions of globules of water may be suspended from the point of a needle, how many must there be in a spring, in a well, in a river, in the sea! If from a lighted candle there issue in a second more particles of light than there are grains of sand on the whole earth, how many igneous particles must there issue from a large fire in an hour! If one grain of sand contain more than a thousand millions of particles of air, how many must there be in the human body! If men can divide one grain of copper into millions of parts, without arriving at the first elements of matter; if odoriferous bodies can exhale a sufficiency of odorous particles, so as to be perceived at a

great distance, without any sensible diminution of weight in those bodies, it would require an eternity for the human mind to calculate the number of these particles!

If we pass next to the animal kingdom, the scene will be infinitely extended. In summer the air swarms with living creatures. Each drop of water is a little world full of inhabitants. Every leaf is a colony of insects. Every grain of sand is the habitation of a multitude of animated beings. Every plant, seed, and flower nourishes millions of creatures. Every person has seen those innumerable swarms of flies, gnats, and other insects which gather together in a small space; what prodigious hosts must there be of them that live, sport, and multiply their kind over the face of the whole earth, and in the immense extent of the atmosphere! How many millions of still smaller insects and worms are there which crawl on the earth, or in the entrails of animals, the number of which is only known to God! With what splendour does the power of God manifest itself to the mind, when we reflect on the multitude of parts of which these creatures are composed, of whose very existence most men are ignorant! Were we not convinced of it by daily experience, could we imagine there were animals a million of times less than a grain of sand, with organs of nutrition, motion, generation, &c. ? There are shell-fish so small, that even viewed through the microscope, they appear scarcely so large as a grain of barley; and yet they are real animals, with durable dwelling-places, the foldings and recesses of which form so many different apartments! How exceedingly small is a mite! Nevertheless, this almost imperceptible point, seen through a microscope, is a hairy animal, perfect in all its members, of a regular figure, full of life and sensibility, and provided with every necessary organ. Although this animal is scarcely visible to us, yet it has a multitude of still smaller parts; and what is yet more admirable is, that the glasses which show us so many faults and imperfections in the most finished works of men, can discern nothing but regularity and perfection in these microscopic objects. How inconceivably fine and slender are the threads of a spider! It has been calculated, that it would take 36 000 of them to make the thickness

of a thread of common sewing silk! Each of the six papillæ, from which the spider draws that glutinous liquor of which it forms its web, is composed of a thousand insensible pores, which give passage to so many threads; so that however fine the spider's thread may appear, it is composed of 6,000 smaller ones!

You are struck with astonishment. But suppose we had microscopes which would magnify some thousands of times more than those glasses do, through which a mite appears no larger than a grain of barley, what wonders should we then see! And even then, should we reach the limits of the creation in these inconceivably small productions? Certainly not: and it would be presumption and extravagance to believe it. Each creature has a kind of infinity; and the more we contemplate the works of God, the more the wonders of his power shall be multiplied in our sight.

Our imagination is confounded in the two extremes of nature, the great and the small; and we know not whether we should admire the Divine power more in those enormous masses, those immense globes which roll above our heads, or in those microscopic animals which are invisible to the naked eye. Should not the contemplation of the works of God be our most pleasing occupation? The trouble of study would be amply compensated by the pure and innocent pleasures which it would afford. It would, at least, awaken in us an ardent desire to arrive in those blessed regions where we should require neither microscopes nor telescopes to enable us to discover the wondrous works of God. There, all his works shall be so unveiled to our eyes, that we shall be able to distinguish the destination, structure, and relations of each object. There, immortal songs of praise shall resound the honour of the Creator of the universe. There, all distinction of great and small shall be entirely done away, for everything shall appear great in our sight, and fill our souls with admiration and joy!

## NOVEMBER XXIV.

## GRADUAL INCREASE OF THE COLD.

WE daily perceive that the cold gradually increases. In the last month we lost part of the warmth of autumn : but the cold was then very moderate ; for the earth was still in a measure warmed by the rays of the sun. The present month is still colder, and the shorter the days grow, the more the earth loses its warmth ; and the cold consequently increases. We cannot doubt this : daily experience proves it. But do we sufficiently consider the wisdom and goodness of the Creator, which are manifest in this arrangement ? It certainly requires but a small degree of attention to discover this wisdom and goodness in the insensible progress of the cold.

In the first place, this gradual increase is indispensably necessary, to prevent a derangement in, if not a total destruction of, our bodies. If the cold which we feel in the winter months were to come suddenly in the beginning of autumn, we should be instantly benumbed, and this change would speedily become mortal. How readily do we catch cold in the cool summer evenings ! And how would it be were we to pass suddenly from the burning heats of summer to the freezing cold of winter ? With how much goodness has the Creator provided for our health and life, in granting us such a temperature in the months which immediately follow the summer, as sufficiently prepares our bodies to endure the increase of the cold without injury !

What would become of the animals whose delicate constitution could not endure the cold, if the winter came on suddenly, and without being previously announced ? Two-thirds of fowls and insects would perish irrecoverably in a single night ; and their eggs and young with them. But as the cold augments by degrees, they have time to make the necessary preparations for their preservation. The autumnal months, which separate the summer from the winter, warn them to leave their present dwellings to go into warmer climates, or seek places

where they may quietly and securely rest during the severe season.

It would not be less fatal to our fields and gardens were the earth to be suddenly deprived of the heat of summer ; all the plants, and particularly the exotics, would instantly perish ; and the spring could produce no flowers, and the summer no fruits.

It is therefore just that in this arrangement we should acknowledge and adore the wisdom and goodness of God. Let us not consider it as a matter of little importance that the heat diminishes insensibly, and the cold gradually increases, from the end of summer to the beginning of winter. These insensible revolutions were necessary, that we, and millions of other creatures, might be able to subsist ; and that the earth might be able to bring forth fruit. If the presumptuous man, who so often dares to find fault with the laws of nature, could displace one single wheel in the great machine, he would soon find, to his cost, that instead of mending, he had marred the whole. Let us understand that nothing is suddenly produced ; and that no change takes place till it is sufficiently matured. All natural events succeed each other gradually, all proceed in the most regular order, and happen precisely at the specified time. ORDER is the great law which God follows in the government of the world ; and hence it is, that all his works are beautiful, regular, and perfect.

Let it be our constant occupation to study the beauty and perfection of God's works, and we shall acknowledge the traces of the Divine wisdom and goodness in every season of the year. Then all those foolish complaints shall cease, by which we have so often insulted our Creator ; we shall find order, wisdom, and goodness even in those things where we thought we could discover nothing but disorder and imperfection ; and we shall exclaim at last, with the deepest conviction : All the ways of the Lord are goodness and truth ; his conduct towards us is mercy and kindness ; but this is evident only to those who love his covenant, and keep his precepts.

## NOVEMBER XXV

## REFLECTIONS ON SNOW.

DURING winter, the dullest season of the year, the earth is often covered with snow. Every person sees it fall, but few take the trouble to examine its nature, or inquire into its use.

This is the general lot of those objects which we have commonly before our eyes, and from which we derive various advantages. Often the things which deserve our attention most, are those which we generally neglect. Let us be wiser in future ; and begin by reflecting a few moments on snow.

It is formed of very light vapours, which being congealed in the atmosphere, fall down afterwards in flakes of different dimensions. In our climates these flakes are often very large ; but we are assured that in Lapland the snow is very small, and resembles fine dry dust. This is doubtless occasioned by the great cold of that country. It is observed, that among us the flakes are large in proportion to the degree of cold ; and that they become very small when it freezes intensely. The little flakes generally resemble hexagonal stars ; but some have eight angles, others ten, and some are altogether irregular. The best way of examining them is to receive them on white paper ; but hitherto little has been said satisfactory on the cause of these different forms. The whiteness of this meteor may be easily accounted for. Snow is extremely thin and light ; consequently it has a great multitude of pores which are filled with air : it is besides composed of parts more or less close and compact ; such a substance does not permit the rays of the sun to pass through, nor does it absorb them ; on the contrary, it reflects them with considerable force, and this is what makes it to appear white to us.

Snow as it falls is twenty-four times lighter than water. This is proved by melting twenty-four measures of snow, for they produce but one of water. For snow is not frozen water, but only frozen vapour. Snow eva-



porates considerably ; and the greatest cold does not impede this evaporation. It has been doubted whether it snows at sea ; but those who have performed voyages in the winter on the northern seas, have assured us that they have there met with much snow. It is well known, that the tops of high mountains are generally covered with snow ; if a part of it melts, it is speedily replaced by new flakes. As the air is much warmer on the plains than it is on the mountain-tops, it may rain on the former, while it snows heavily on the latter.

Snow has a variety of uses. As the cold of winter is more injurious to the vegetable kingdom than it is to the animal, plants must perish, were they not protected by some covering. God has so ordered it that the rain which in the summer fell to cool and nourish the plants, should fall in winter under the form of soft wool, which covers the vegetables, and protects them from the rigours of the frost, and the chilling blasts of wind. Snow has a certain degree of warmth, but so temperate as not to stifle the grain. And, as it contains, like all other vapours, different salts, which it drops when thawed, it contributes much to the fertilization of the earth. When, therefore, the snow melts, it becomes a fruitful moisture to the earth ; and at the same time, washes away from winter seeds and plants whatever might prevent or injure their growth. What remains of this snow-water, helps to supply springs and rivers, which were diminished during the winter.

These reflections may be sufficient to convince us of the goodness of God, which is manifest in the meteor of which we have spoken. We see plainly that winter has its advantages, and that it is not such a gloomy season as many imagine. Let us raise our hearts in gratitude and joy to that beneficent God, who even from snow and clouds pours down blessings and abundance upon the earth. Our complaints and murmurs are insulting to the divine government ; and they are the more criminal, because we may in every occurrence behold the footsteps of the wisdom and goodness of God.

## NOVEMBER XXVI.

## SLEEP OF ANIMALS DURING WINTER.

NATURE seems dead at present, because it is deprived of so many creatures which in summer rendered it so beautiful and lively. Most of the animals which have disappeared, are buried during the winter in a profound sleep. This happens not only to caterpillars, but also to may-bugs, ants, flies, spiders, snails, frogs, lizards, and serpents. It is an error to suppose that the ants lay up provisions for winter ; the least cold benumbs them, and they continue in this state till spring. Of what use then would magazines of provision be, seeing nature has prevented their need of food in winter ? Nor does it appear that they collect stores for other animals. What they collect during the summer with so much care, serves not for their subsistence ; they employ it only as materials for building their habitations.

There are also several birds which, when food begins to fail, hide themselves in the earth, or in caves, to sleep out the winter. We are assured, at least, that before winter sets in, the strand-swallows hide themselves in the earth ; the wall-swallows hide themselves in holes of trees and old buildings ; and the house or common swallows seek for ponds, where they fasten themselves in pairs, and cling to roots or reeds, and continue without motion, and apparently without life, till the return of spring re-animates them.

There are some beasts also which bury themselves in the earth towards the end of summer. The most remarkable of these is the mountain-rat, which generally lives on the Alps. Though it delights in the highest mountains, in the regions of frost and snow, it is, nevertheless, more subject than any other animal to be benumbed with the cold. Hence it is, that these animals hide themselves about the end of September, or beginning of October, in subterraneous dwellings, in which they remain till April. There is much art and precaution in their winter residence. It is a sort of gallery.

the two wings of which have a particular opening; and both terminate in a place where there is no other opening; and this is their habitation. One of these two branches goes sloping down from the place where they lodge; here they deposit their excrements, the moisture of which readily runs off. The other branch is more lofty, and serves them to go in and come out by. The place where they dwell is lined with hay and moss. This animal lays up no provision for winter, as it would be useless. Before they enter into their winter quarters each prepares a bed of moss and hay with great care; and when they have formed the two openings of their dwelling, they compose themselves to sleep. As long as their torpid state endures, they taste nothing. At the commencement of winter they are so very fat, that some of them weigh not less than twenty pounds; but they fall away by degrees, and are very lean in the spring.

As they eat nothing during the winter, they have no evacuations, their *cæcum*, or first great gut, is furnished with annular valves, which retain the excrement till the time of their waking. We are informed, that as soon as these animals feel the first approach of the cold, they go to some spring, where they drink so long and so plentifully, that the water which they make comes from them as pure and clear as it was when they swallowed it. A natural instinct leads them to this, to prevent the corruption which matters accumulated in their stomach might occasion, during their long state of torpidity. When these animals are discovered in their retreats, they are found rolled up in a lump, enveloped with hay; their nose laid in their belly, that they may not perspire too much of their moisture; their lymph wastes fast enough; and it was highly necessary to have attenuated their blood by the quantity of water which they drank. During their torpid state they may be carried away without awaking them; and they may be even killed without appearing to feel it. There is another species of rats, whose sleep is as long and profound as that of the mountain-rat, and which are therefore termed the seven-sleepers. Bears eat prodigiously at the beginning of winter; and they seem to eat as if they intended to devour as much at once as would be sufficient for their whole lives.

As they are naturally fat, and are excessively so at the end of autumn, this abundance of fat enables them to endure their abstinence during the winter. Badgers prepare themselves in the same manner for their winter's repose.

The instinct of these and other animals teaches them how to preserve themselves without nourishment during so long a time. From their first winter, even before they could have learnt anything by experience, they foresee their long sleep, and provide against it. In their peaceable retreat, they neither feel want, hunger, nor cold. They know no other season than that of summer, and what is still more remarkable is, that all animals do not sleep thus during winter ; it is only those which with the severe cold can also endure an abstinence of several months. If the winter came upon them unawares, so that, though enfeebled with hunger, and benumbed with cold, they still continued to live, it might be said that there was nothing surprising in this but the strength of their constitution. But as they know how to prepare themselves beforehand for the time of their sleep, and as the most of them do this with much care and precaution, we are obliged to attribute the whole to an admirable instinct, with which the Creator has endued them. Yes, the wisdom and goodness of God have provided for the wants of all his creatures ; and this he can do by a thousand different ways, which the human understanding cannot conceive. May we not conclude from this, that as he thus watches over all the works of his hands, he will not disdain to watch even for our preservation and comfort ?

## NOVEMBER XXVII.

### USE OF STORMS.

PERHAPS there are several who in this stormy season reckon winds and tempests among the disorders and scourges of nature. They do not consider the benefits which result from them, as without them we should be a thousand times more unhappy than we really are.

Nothing can be truer than this: tempests are the proper means of purifying the atmosphere; to be convinced of which, we have only to pay attention to the general state of the weather at this season. What thick and unwholesome mists, what rainy, gloomy, and cloudy days have we at present! Storms are chiefly designed to disperse these noxious vapours, and remove them from us; and this is doubtless a great benefit which we derive from them. The universe is governed by the same laws as man, who is not improperly called a little world. Our health consists in a great measure in the agitation and mixing of the various humours, which, without this, would soon grow corrupt. The case is the same with respect to the world; that the air may not become injurious either to the earth or to animal life, it is necessary that it should be continually agitated, and this the winds effect. I do not mean gentle, light winds, but storms and tempests, which collect vapours from different countries, and forming one mass of the whole, mix the good and bad together, and thus correct the one by the other.

Storms are also useful to the sea. Were it not violently agitated, the stagnation, even of salt water, would produce a degree of putrefaction, which would not only become mortal to the innumerable shoals of fish which live in it, but would also be very injurious to those who sail on it. Motion is the soul of universal nature; it preserves everything in order, and prevents destruction. Were the sea itself excepted from the general rule, as it is the common receptacle of all the dregs of the earth, where so many millions of animal and vegetable substances putrefy; were it not continually agitated, its waters would putrefy, and infect everything with their insupportable stench. Motion is as necessary to the sea as the circulation is to the blood of animals; and the other causes, which give it a gentle, uniform, and almost insensible motion, are not sufficient to purify the whole mass. Nothing but storms can produce this effect: and we see what great advantages result from this, not only to men, but also to many millions of other animals.

These are some of the uses of storms, and the reasons which ought to prevent us from considering them as destructive scourges and instruments of the divine ven-

geance. It is true that storms have often destroyed vessels richly laden, destroyed the hopes of the husbandman and the gardener, laid whole provinces waste, and spread terror, desolation, and horror everywhere. But what is there in nature which has not its inconveniences, and which may not become in certain respects noxious? Shall we reckon the sun in the list of the scourges of our globe, because, from his situation, the earth is for some months barren, and at other times his heat scorches and dries up our fields? Those phenomena of nature should only appear formidable to us, where the advantages are little or nothing in comparison of their attendant evils. But can this be said of storms, if we consider the benefits which result from them to the earth, to men, and to beasts? Let us therefore acknowledge, that God has planned all in wisdom, and that we should be satisfied with the present constitution of things. Happy they who are convinced that everything in the universe tends to the general good of the creatures, that the evil which may be found in the world is compensated by numerous advantages; and that the means even which Providence makes use of to prove and chasten us, are in themselves indispensable benefits, the general effects of which abundantly compensate for the partial evil which in some particular cases may result from them.

## NOVEMBER XXVIII.

### FORTUITOUS EVENTS.

PROPERLY speaking, chance can produce nothing, for nothing can happen but what has its real and determinate cause. What we call chance, then, is no more than the unexpected concurrence of several causes, which produce an unforeseen effect. Experience teaches us that these kinds of causes are frequent in human life; unforeseen accidents may entirely change the fortune of men, and blast all their designs. Naturally speaking, it seems as if the race should be to the swift, the battle to the strong, and success to the most wise and prudent; but this is not always the case; and often an unexpected

accident, a favourable circumstance, and an event which it was impossible to foresee, are more effectual than all that human power, wisdom, and prudence can perform. How many would be to be pitied, if a wise and beneficent hand did not regulate every event ! And how could God govern men, if what is called chance were not obedient to his voice ? The lot of individuals, of families, even of whole kingdoms, depends often on circumstances, which may appear to us little and despicable. Were we to deny that Providence governs these small events, we must at the same time deny that it has any influence in the greatest revolutions which happen in the world.

We see that accidents daily take place on which our temporal happiness or misery in a great measure depends. It is evident that we cannot guard against this sort of accidents, because we cannot foresee them. But it follows thence, that these unexpected events, which are above our understanding, are nevertheless subject to the empire of Providence. The wisdom and goodness of God leave us, more or less, to ourselves ; according to the degrees of strength and understanding we have to conduct ourselves rationally. But in those circumstances, where our strength and prudence can perform nothing, we may rest assured that God will more particularly watch over us for good. In all other cases, human labour and industry must concur with the aid and protection of heaven ; for it is only in those unforeseen accidents that Providence acts alone. And as in all that is termed chance we see evident footsteps of the wisdom, goodness, and justice of God, it is manifest that chance itself is subject to the divine government ; and it is then that the empire of Providence appears with most splendour. When the beauty, order, and arrangement of the world fill us with admiration, we conclude, without hesitation, that an infinitely wise Being must preside over it. With how much greater reason should we draw the same conclusion, when we reflect on those great events, produced by accidents, which the human mind could not foresee ! Have we not a thousand examples that the happiness, and even the life of men, the fate of nations, the issue of a war, the revolutions of empires, and other similar affairs, depend on accidents, absolutely unforeseen ? An

unexpected event may confound projects concerted with the utmost secrecy and address, and annihilate the most formidable power. It is on the well-grounded belief of a Providence, that our faith, tranquillity, and hope must rest. Whatever the evils may be which surround us, however great the dangers by which we are threatened, God can deliver us by a thousand means, entirely unknown to ourselves. The lively persuasion of this consolatory truth ought, on the one hand, to fill us with profound respect for the Governor of the world ; and on the other, engage us to seek God in all things, to raise our hearts always to him, and to put our whole trust and confidence in him. This truth ought likewise to curb our pride, and inspire, particularly, the great men of the earth, with that religious fear which they should have for the Supreme Being, who holds in his hands a thousand means unknown to us, by which he can overturn the fabric of happiness which we have so arrogantly erected. Lastly, this same truth is better calculated than anything else to banish from our souls all distrust, anxiety, and discouragement, and to fill us with holy joy. "The infinitely wise Being has a thousand ways unknown to us ; but they are ways of mercy and love, and all his dispensations are regulated by wisdom and justice. He wills the happiness of his creatures, and nothing can oppose his will. He commands, and universal nature is obedient to his voice."

## NOVEMBER XXIX.

### THE MAJESTY OF GOD.

NOTHING is more difficult than to endeavour to form such ideas of God as are in any degree worthy of his greatness and majesty. It is as impossible for us to comprehend him perfectly, as it would be to hold the sea in the hollow of our hand, and compass the heavens with a span. Of God it may be justly said, HE is both well known to and concealed from us. He is very nigh, and yet infinitely beyond us. Well known and very nigh in respect to his being, and infinitely distant and



hidden in respect to his nature, perfections, and purposes. But on this very account it is our duty to endeavour to know his greatness, as it is necessary that we should form those sentiments of veneration for him which are his due. To assist our weakness in this respect, let us compare him with what men esteem and admire most, and we shall see that God is infinitely above all.

We admire the power of kings, and we are filled with astonishment when we find they have conquered vast empires, taken cities and fortresses, erected superb buildings, and have been the means of the happiness or misery of whole nations. But if we are struck with the power of a man, who is but dust and ashes, the greater part of whose exploits is due to other agents, how should we admire the power of God, who has founded the earth and formed the heavens; who holds the sun in his hand, and upholds the immense fabric of the universe by the word of his power! We are with reason astonished at the heat of the sun, the impetuosity of the winds, the roaring of the sea, the peals of thunder, and the inconceivable rapidity of the lightning; but it is God who lights up the solar fire, who thunders in the clouds, makes the winds his messengers, the flames of fire his ministers, and who raises and calms the waves of the sea.

We justly respect those who have distinguished themselves by the extent of their genius and their knowledge; but what is knowledge, what the whole human understanding, in comparison of the wisdom of that august Being, before whom all is uncovered and all known; who counts the stars of heaven, numbers the sands of the sea, knows the path of every drop that falls from the atmosphere, and who, with one look, beholds the past, the present, and the future in the same moment! How much wisdom shines in the construction of the universe, in the revolutions of the planets, in the arrangement of our globe, in the meanest worm, and in the smallest flower! They are so many masterpieces, which infinitely surpass the most magnificent and most perfect work of man.

We are dazzled with the splendour of riches; we admire the palaces of kings, the magnificence of their

furniture, the pomp of their clothing, the beauty of their apartments, and the abundance of gold, silver, and precious stones which shine on every side ; but how little is this, compared with the riches of the Lord our God, whose throne is the heavens, and whose footstool is the earth ! The heavens are his, and the earth also ; the habitable world, and all that dwell therein. He has fitted up dwellings for all creatures, he has established stores for all men and all animals ; he causes grass to grow for cattle, and corn for the service of man. All that is useful and excellent in the world is drawn from his treasures. Life, health, riches, glory, happiness, everything that can constitute the good of his creatures ; all are in his hand, and he distributes them according to his good pleasure.

We respect the great men of the earth, when they command a multitude of subjects, and reign over many countries ; but what is that spot which is subject to them, in comparison of the empire of the universe, of which our globe is but a small province, which extends over all the heavenly bodies and their inhabitants ! How great must that Master be who has all the monarchs of the universe for his servants, and who beholds around his throne the cherubim and seraphim ever ready to fly to execute his orders !

We judge of the greatness of men by their actions ; we celebrate kings who have built cities and palaces, who have governed their estates well, and who have successfully accomplished great designs. But how astonishing are the works of the Most High ! How wonderful the creation of this immense universe ; the preservation of so many creatures ; the wise and equitable government of innumerable worlds ; the redemption of the human race ; the punishment of the wicked, and the recompence of the good !

Who is like unto thee, O Lord ? Thou art great, thy name is great, and thy works proclaim thy grandeur ! Nothing can be imagined equal to the greatness of our God. Should not a religious reverence ever possess our souls at the thought of the presence of the Ruler of the world, the Lord, who encompasses all our paths ? The brightness of the stars is absorbed by the presence of the

sun ; thus all the glory, all the knowledge, all the power, and all the riches of the world vanish, when compared with the glory and majesty of God. The soul exults and is ennobled in meditating on the greatness of the Most High. Such sublime meditations delightfully exercise all our spiritual faculties ; we are filled with reverence, admiration, and joy ; when, in a holy transport, we represent to our minds the Being of beings, the Eternal, the Almighty, the Infinite ! Can we help exclaiming with ecstasy, The Lord, he is God ! the Lord, he is God ! Give glory to Him for ever and ever !

## NOVEMBER XXX.

### MOTIVES FOR CONTENTMENT.

LET sweet contentment take possession of our souls. God is good ; mercy and love shine through all his works. Let us contemplate his mighty deeds ; the world and all it contains proclaim him ; all that he has formed is worthy of him alone.

The heavens and the earth are proofs of his power ; the sun who rules the day, and the moon who rules the night ; all that is endued with motion and life exalt the mighty God.

Consider the works of his hands ; man and brute show that his power is infinite ; even the smallest objects, the spire of grass and the grain of dust, teach the knowledge of the Lord.

Ask the mountains and the vallies ; the heights of heaven and the depths of the ocean ; the winds and the tempests ; the despicable worm that crawls in the dust ; and they will all proclaim his wisdom infinite, and his power unbounded.

How shall we exalt him ? With what songs of praise shall we celebrate that God who has given us life and being ? Our bodies, and the souls which animate them, are presents from his hand ; may we magnify him as long as we have a being !

Objects of his faithful care throughout the day, each morning witnesses that he has watched over us during

the darkness of the night. No moment passes without furnishing us with motives to bless him who is the light and strength of our life.

If we be a prey to adversity, and oppressed by sufferings, scarcely do we feel the weight of them, till the Divine power comes in to enable us to support them. His victorious strength comes to our succour, and our difficulties are surmounted.

O my soul, thou hast long experienced this; let it never be forgotten; never give way to the fear that thou shalt be abandoned by that God who cannot hate any thing he has made.

Let us submit to his holy will, and bless him for all his dispensations, persuaded that he will accomplish his merciful designs; for he is great in counsel, and abundant in means.

#### GRATITUDE AT THE REMEMBRANCE OF PAST MERCIES.

ALMIGHTY God, thou art the common Father of all the generations which dwell on the earth; thou art my Father also. May I feel myself absolutely dependant on thee, not only in respect to my existence, but also for everything I possess. I bless thee, I give thee thanks for the life which thou hast granted me, and for all the mercies which thou hast heaped upon me from the beginning until now.

I bless thy kind providence for my tender family relations, and for all the comforts and benefits which I have enjoyed in domestic life.

I bless thee for the life and health I enjoy, and for the abundant means which thou hast provided to feed, clothe, and furnish me with a convenient habitation. Thou, Lord, hast provided for all my necessities.

I give thee thanks for the success with which my just enterprises and the labours of my calling have been crowned; for all the blessings which thy liberal hand has daily conferred on me; and for everything which has in any way or measure contributed to my preservation and temporal happiness.

I should also bless thee, that when thou didst permit

adversity and affliction to approach my dwelling, thou didst not then leave me without comfort and support. In the midst of my trials, and the just chastisements which thou hast sometimes inflicted on me, thou hast not abandoned me. Thou hast softened and moderated the corrections which I deserved; and thou hast condescended again to restore me to thy favour. Thy fatherly hand has guided me, and thou hast rejoiced over me to do me good.

Should not the constant experience which I have had of thy goodness fill me with perfect confidence, and encourage me to trust my soul, body, and interests in thy hands? May I not hope that thou wilt continue to watch over me; and that, as far as thou judgest it consistent with my real happiness, thou wilt preserve me from those ills and distressing accidents which might disturb my repose? May I enjoy, with a wise and grateful heart, the mercies thou grantest me; that in prosperity I may ever aspire after thee, who art the Author of all good! But if thou hast determined, in the impenetrable councils of thy wisdom, that I should pass through various ills, afflictions, and disappointments, may I submit with perfect resignation to the wise dispensations of thy providence, and glorify thee to the utmost of my power, in adversity as well as in prosperity!

To thee, O Lord our God, to thee, who art the Father of all thy intelligent creatures, in heaven and in earth, to thee be honour and glory, now and for ever!

## DECEMBER.

### A HYMN OF PRAISE.

WELL may our souls be astonished and filled with admiration, when we reflect on the unmerited mercies which we have received from the hands of the Lord our God! Laden with his mercies, filled with transport, how can we sufficiently express our gratitude and joy!

While we were yet asleep, concealed in our mother's womb, thou didst then fix our lot; thou hast regulated

the condition of mortals before their eyes saw the light of the day; and mine was (O blessed lot!) to be born in a Christian land.

Full of compassion for our weakness, thou didst incline thine ear to our infant cries; our lips stammered thy praises; and thou didst condescend to hear what could not as yet be termed prayer.

When, in the giddiness of youth, we wandered far from the paths of virtue, thy merciful goodness condescended to recall us to a sense of our duty.

Thou hast been our shield and fortress in danger and distress; and thou hast often preserved us from the snares of vice, more to be dreaded than the worst temporal calamities.

When, threatened with death, a mortal paleness was diffused over our face, thou didst rekindle the almost extinguished lamp of life; and when the remembrance of our transgressions tormented our souls, thy grace afforded us comfort.

Blessed art thou who hast loved us so well, who hast given us the sweet consolations of friendship. But what is that greatest of all benefits which the heart can conceive; for which this heart, entirely consecrated to thee, desires to exalt thee, the greatest good which can be possibly enjoyed on earth?—Is it not, my God, to be permitted to approach thee, to celebrate thy mercy, and to glorify the name of the Almighty?

In my fears, in my distresses, in dangers and wretchedness, I will confide in thy mercy alone. When my soul is strengthened by thee, even death itself shall lose its terrors.

When the heavens shall pass away with a mighty noise, when the fabric of the universe shall be dissolved, I shall triumph above its ruins, and bless the powerful hand that has raised me above the wreck of a crushed world. O thou Most High, eternity is too short to utter all thy praise!

*Note.*—There is a great similarity between the above hymn (which makes fourteen verses in the German), and the celebrated hymn of Mr. Addison, which begins with, "When all thy mercies, O my God," &c. Has not the German borrowed from the English poet?

## DECEMBER I.

## THE MERIDIANS.

THERE can be nothing effected to good purpose, in practical astronomy or geography, without an accurate knowledge of the position of the meridian line. A plumb-line and the axis are two lines intersecting each other in the centre of the sphere; one of them meets the heavens in zenith and nadir, the other in the poles; a plane passing through these two lines cuts the surface of the sphere in a circle, which is the meridian; the meridian, therefore, is a great circle passing through the two poles, the zenith and nadir. And since the plumb-line is at right angles to the plane of the horizon, and the axis to that of the equinoctial, the meridian will be at right angles both to the horizon and equinoctial, and therefore also perpendicular to all the parallels of declination.

When the sun or any star rises on the eastern verge of the horizon, by reason of its diurnal motion it ascends in the heavens, till it has reached the midway of that part of its parallel of declination which is above the horizon, called the diurnal arc; after that it descends through the western half of the same arc. This highest point of the object is in the meridian of the place, which may be thus explained. The centre of the equinoctial and of all the parallels of declination are in the axis of the sphere, and therefore in the lines which are the common sections of the planes of the parallels with the plane of the meridian; and these lines are perpendicular to the common section of the planes of the horizon and parallels, and therefore meet the heavens in the highest and lowest points of the parallels which are cut by the horizon, and equally divide both the upper and lower parts; these lines likewise meet those parallels which are not intersected by the plane of the horizon in their highest and lowest points; and since these lines are in the plane of the meridian, the highest points of the diurnal arc and the lowest points of the nocturnal arc

are in the meridian, and this circle cuts both these arcs into two equal parts. Hence the meridian divides the artificial day and also the natural day into two equal parts, that is, so far as the day depends on the diurnal motion; and from this circumstance it has the name of meridian or mid-day line.

If a sharp-pointed piece of metal be any how firmly fixed in an horizontal plane, and from a point perpendicularly under the summit several concentric circles be drawn, and the exact point marked where the shadow of the summit meets the circumference of any of them in the forenoon, and likewise in the afternoon, where it meets the same circle, then a straight line drawn through the middle, between these two points and the centre, will be a meridian line. Several circles being drawn, gives an opportunity to take that which answers at both times should clouds occur; and also it will prove the work, if the meridian be found by two of the circles. If the extremity of the shadow of any stile be marked several times on any plane on an equinoctial day, a line drawn through the points is an east and west line, and a perpendicular to it is a meridian. By these methods the meridian may be found quite near enough for any common purpose. For the basis of astronomical computations more attention and nicety are requisite.

Since the plane of the celestial meridian passes through the centre of the earth and the axis, its intersection with the earth will be a great circle on its surface, in which are situated the terrestrial poles and the place of the spectator; and since every point in the heaven is the zenith to some point on the earth, a meridian may be conceived to pass through every point of the celestial sphere, and a corresponding one through every place on the earth, and the whole of them will intersect in the poles. It is also clear, that if a person move directly north or south, he will continue in the same meridian; but if he go either east or west, he changes his meridian. On the other hand, if we conceive the plane of a terrestrial meridian extended every way, the extended plane cuts the heavens in a meridian there. Now suppose this extended meridian of any place to be fixed in respect of the earth, but carried round with it in its real



diurnal motion ; as the earth revolves on its axis, this extended plane or meridian will cut successively the different celestial meridians ; and when any object or point in the heavens, as a star, sun, or moon's centre, or the centre of any planet or comet, appears in that revolving plane, that object or point is said to be on the meridian, or to transit the meridian. The degrees of the meridian, from the horizon to the pole, is called the elevation of the pole, and from the horizon to the equinoctial, the elevation of the equinoctial ; and these two elevations are together a quadrant, or ninety degrees, because the whole semicircle, or part of the meridian above the horizon, is  $180^{\circ}$ , and from the equinoctial to the pole is  $90^{\circ}$ . Hence, if the height of the sun or of a star be known, and also its distance from the pole or equinoctial, the latitude of the place, or its distance from the equator, will be also known. Thus has Providence furnished us with an easy method of finding our change of region, in respect of north and south, when we travel by land or sea into distant or unknown parts of the earth's surface ; a matter of great importance to commercial people. If we observe the fixed stars, we find that they always transit the meridian at the same point of it, with the exception of a very minute deviation, which can only be discerned by the continued observations of very accurate astronomers ; but the sun, moon, and planets will be seen to cross the meridian in very different points, on their different returns to it, regularly cutting it more and more to a certain extent northward, and then again southward ; and thus it is that we find the sun in these northern countries nearer our zenith in summer than in winter.

There is a period of man's life which is called the meridian, and which, when once passed, we see the vital spark decline, and continue to approach the western boundary of its sphere, when it disappears, and eludes our sight. As we see the sun rise, reach its utmost height on the meridian, and at last set, so we see man begin his course, reach the highest point of his circle, and afterwards he is soon hidden from the eyes of the beholders. However, there is certainty in the sun's course ; but as to the course of human life, how full of

uncertainty is it in every stage ! Who can tell whether or not he shall reach the true horizon, or even the meridian ? Let us, then, be prepared for every circumstance. The man who seeks not a preparation for death is not in a state fit for life ; a qualification for death is that alone which can render life itself agreeable. O Lord, my Redeemer, through thine infinite merits remove my sins far from me, and fill my soul with the blessed principle of thy divine love.

## DECEMBER II.

### THE ERA OF THE CREATION OF THE WORLD AND THE FORMATION OF MAN.

IF we fix the epoch of the creation of the world according to the testimony of the sacred writings, it can scarcely have subsisted 6000 years. Those who suppose it much older are contradicted, both by reason and the historic monuments which have been handed down to us. The history of the human race does not go further back than that which Moses has written ; for all that has been said concerning the origin of ancient nations is advanced without proof, nor does their history extend beyond the general deluge. As to the chronological books of the Chinese, they are evidently full of falsities. The Phœnicians have no historian more ancient than Sanchoniatho, who lived after Moses. The Egyptian history does not extend beyond Ham, the son of Noah ; and the books of the Jewish lawgiver are not only the most ancient, but also the most authentic of all the monuments of antiquity. If the world were some thousands of years older, it must be much better peopled than it is at present. Population has always increased since the deluge, and yet there might be three times as many more inhabitants on the earth than it at present contains. It has been computed, that at least 5,000,000,000 of men might live at once on our globe ; and yet it does not appear that there are really more than 1,080,000,000. In Asia are reckoned 650,000,000 ; in Africa and America, 300,000,000 ; and in Europe, 130,000,000.

If we consider the arts invented by men, we shall

find that few or none of them have been discovered more than two or three thousand years. Man owes not only to his nature and reason the aptitude he has for acquiring arts and sciences, but he is also led to this by necessity; by the desire he has to procure himself conveniences and pleasures; by vanity and ambition; and by luxury, the child of abundance, which creates new wants. This propensity is evident among all men, in all ages. History carries us back to the time when men had scarcely invented the most necessary arts; when those arts which were known were but very imperfectly understood; and in which they scarcely knew anything of the first principles of the sciences.

About four thousand years ago men were still in a state of great ignorance, concerning most subjects; and if we calculate according to the progress which they have made since that time, and afterwards go back to the remotest periods, we may with tolerable exactness fix the era when men knew nothing; which is, in other words, that of the infancy of the human race. Were their existence to be carried higher, it is utterly improbable that the most useful and necessary arts should have continued unknown to them through such a long series of ages. On the contrary, all that can be discovered by the human mind must have been known a long time ago. From this circumstance, therefore, we must conclude, that the origin of the human race can have no other era than that which Moses has assigned it in his history of the creation. Would it not be absurd to suppose that men, during the course of so many thousand years, could have remained enveloped with the thickest darkness, and plunged in a sort of lethargy, from which they suddenly awoke, and began to invent arts to procure themselves the pleasures and conveniences of life?

Another circumstance should be remarked here: almost all Europe was formerly covered with immense forests, very few cities, towns, or villages being found in it. It is manifest that it must be better peopled now than it was at that time. Germany, for instance, was then but one great forest; judge, therefore, what a desert it must have been! At first, men could only sow vacant places which were found here and there in the forests; they

had no separate property, and changed their place of residence every year. In all Germany there was not a single fruit-tree. Acorns alone prevailed. If we wish to draw a parallel between ancient and modern Germany, we must first put aside the inhabitants of cities and towns; pay attention to the numerous colonies which Germany has sent to other countries; observe, that most of the forests being now cut down and converted into arable ground, ancient Germany could scarcely have had one tenth part of the cultivated ground which it at present contains, and consequently could have had but one tenth part of its present number of inhabitants. How many millions less of men at that time than now! And how abundantly must they have been multiplied since! And yet, the forests which extend from Germany to the north-east of Asia, and those that remain still in Africa and America, prove that the earth is not as well peopled as it might be. The further we go back into antiquity, the less we shall find the world peopled and the earth cultivated, till we arrive at the epoch of the birth of the human race. It is therefore impossible that our globe should have been eternal, for, had it been so, it must have been as well peopled from time immemorial as it is at present.

All these considerations lead us to him who is the Creator of the heavens and the earth. From him, the world and its inhabitants derive their being. All things were made by him, and he was before worlds or creatures existed; and shall be eternally the same, when new worlds and new earths shall be produced. And shall not we also live for ever? Delightful and transporting thought! When the heavens shall pass away, I shall remain! And while eternity rolls on, I shall be found in the realms of beatitude!

### DECEMBER III.

#### THE UTILITY OF DIFFERENT KINDS OF TIMBER.

HOWEVER great and numerous the advantages may be which we derive from every part of a tree, yet there is none that can be compared with that which the wood

itself affords us. It grows in such abundance that we may justly say, God every day provides a new supply, that we might never be destitute of so useful a substance. It answers every end we wish to accomplish by it. It is pliant enough to take every sort of form we desire ; and rigid enough to keep that form we have given it ; and as it is easily sawed, bent, and polished, it furnishes us with many utensils, conveniences, and ornaments.

But these are far from being the most important advantages, as the greater part relate only to purposes of convenience and luxury ; we have wants of a more pressing nature, which we could not supply had not wood a proper degree of thickness and solidity. Nature, it is true, supplies us with a great many heavy and compact bodies ; we have common stone and marble, which we may apply to various uses ; but it is so difficult to raise them out of their quarries, to drag, and hew them, that they become very expensive ; whereas we can, with much less trouble and cost, procure the largest trees. Wooden piles, from sixty to ninety feet long, sunk down in the earth, make a sure foundation for walls, which, without this precaution, would sink into the clay, or tumble down where the foundation was sandy. These piles, forcibly driven down and made firm, constitute a forest of immoveable and incorruptible trees, which support the most heavy and extensive buildings ; other pieces support the stone-work, and all the weight of tiles, lead, &c., which form the roofs of our houses.

Wood is also a preservative of life, as it is with many the principal fuel, without which they could neither preserve life, nor supply one half of their necessities. It is true that the sun is the soul of nature ; but it is impossible for us so to collect his rays as to dress our food, or melt our metals. Fire-wood, in some measure, supplies the place of the sun ; and the regulation of the degrees of heat depends on our own choice. The long nights of winter, the cold mists, and the north wind would freeze our blood, were we deprived of the comfortable heat produced by wood. How necessary then is wood ! and was it not for the wisest purposes that the Creator of the world has covered so great a part of the earth's surface with forests ?

But do we consider wood in its various uses as a blessing from God? Have we properly reflected on the benefits we derive from it, and acknowledged that they contribute much to our well-being? Or, because these blessings are so common, have we not considered them as of little importance? It is true that we can get wood more easily than gold or diamonds; but is it on this account a less peculiar blessing of Providence? Are we under less obligations to return thanks to God for it: or is it not this very abundance, and the ease with which it is acquired, which should excite us so much the more to magnify the Creator for this precious gift; the quantity of which is proportioned to our necessities? These reflections may become a fruitful source of thanksgiving, if we only accustom ourselves to indulge them in a lively, serious manner. The winter would furnish us with many blessed exercises of piety, were it our delight to meditate on the mercies of God; and especially on those which he grants us at this season. While reflecting on the warmth which wood affords us in countries where pit-coal is not to be found, would it not be natural to expect that we should thus address ourselves to God: "Compassionate Father! This also is one of thy blessings; I receive it from thy hand with a lively sense of gratitude; and I acknowledge thy providential care in this gentle warmth by which my frozen limbs are invigorated. Whether I feel the scorching days of summer, or the piercing cold of winter; whether I breathe in the open air, or in a warm apartment, thou always showest thyself my benefactor. O, let me not forget any of thy mercies! And, as in each season of the year I receive peculiar marks of thy goodness, may I glorify and bless thee at all times! Let me never consider even fire-wood with indifference; but may the use which I make of it be a constant motive to induce me to exalt thy goodness!" These devout reflections are so far from being unnatural, that it would be utterly inconsistent both with religion and reason, were they not frequently cultivated in our minds.

## DECEMBER IV

## REMARKABLE PROPERTIES OF CERTAIN ANIMALS.

WE daily enjoy a variety of advantages which we derive from certain animals. The Creator has given us some to live in a state of society with us, and others to nourish us ; and all are designed in one way or other to minister to our necessities or pleasures.

The dog is far from being a despicable animal. Independently of the beauty of his form, his vivacity, strength, and swiftness, he has all those internal qualities which may attract the notice of man. He possesses exquisitely tender feelings, which education still improves, and which render him worthy of being a companion for man. He knows how to promote his designs, watch for his safety, defend and flatter him by turns, and by assiduous services, and repeated caresses, render himself pleasing to his master. Without the assistance of this faithful domestic, man could not so easily vanquish and tame the other animals. In a word, it seems as if God had given the dog to man to serve as a companion, a help, and a guard. This very interesting animal merits our attention in other respects, and particularly in this, that he performs several actions which prove he is not a simple machine, but that he possesses a self-moving principle. How expressive are the signs by which he manifests his joy at his master's return ! But these signs are widely different from those which he discovers when he sees a thief, or a wolf, or when he is pursuing a hare. What cautious ardour, what cunning and prudence, do we observe in all his motions !

The advantages which we derive from the sheep are still more considerable, although it has not the gift of pleasing like the dog. Every part of the sheep is useful ; its milk, wool, flesh, and even its bones. What is most remarkable in this animal is, that it ruminates, or chews the cud. As it swallows its food hastily without sufficiently chewing it, it can bring it up again, rechew, and swallow it a second time. The cause of this is, its having

but one row of teeth ; but this defect is compensated by the multiplicity of its stomachs. Of these the sheep has four. In the first, which is called the paunch, and is very large, the food which is raw, and almost whole, is a little moistened. The second, which is named the cap, or hood, is much smaller ; in it the food is better macerated, and digestion begins to make some progress. From this it passes into the third stomach, called the leaf or folds ; in this it continues till it is properly soaked and dissolved ; for this intestine is composed of many folds or leaves, which permit nothing to pass but what is fluid. Finally, the digestion is perfected in the fourth stomach, which is called the rennet bag ; in this the food changes its colour, and becomes as white as milk ; though in the third stomach it was quite green.

The hare is neither destitute of instinct to provide for its own support, nor sagacity to escape from its enemies. It makes its own form or bed ; and in winter chooses those places which are exposed to the south ; and in summer to the north. In order to hide itself, it squats in furrows or between hillocks, which are nearly the colour of its own fur. When it is hunted, it runs for a while rapidly forward, then it returns on its own steps, throws itself into by-paths, and after many leaps and doublings hides itself in the trunk of a tree or in a bush. It has cunning enough to change the place of its residence continually, according to circumstances.

The stag has more cunning and subtlety even than the hare, and gives still more trouble to the huntsman. Its elegant light form, its slender well-proportioned shape, its branching horns, which serve it more for ornament than defence, its size, swiftness, and strength, distinguish it from all the inhabitants of the woods ; and it seems to have been made to embellish and enliven the solitude of the forests.

When we reflect on these and innumerable other animals, we must acknowledge more and more with what goodness the Lord has provided for our support, convenience, and pleasure. Our globe is the habitation of a multitude of creatures, which are in general subjected to man, and exist only for his service. And if the soil is so diversified, it is that a greater number of living



creatures may find aliments suited to their respective natures. Are not all kinds of soils, the good and the bad, the sandy and the marshy, the rocky and the clayey, from the canks of the rivers to the tops of the mountains, stocked with animals, which are in one way or other useful to man? Fowls are fed with the fragments from our tables, from which we derive great advantages. The delicate flesh of pigeons pays us with interest for the expense we are at in procuring them convenient and safe retreats. Swans free our ponds from a multitude of plants which would corrupt there. Hosts of ducks and geese yield their feathers to us for beds; and they only ask, as a return for their spoils, a little poor food, and a pond where they may wash, play, dive, and seek for worms.

In a word, there is no place, how parched or barren soever it may be, but produces various animals, which are useful to man. Can we then forget the riches of the divine goodness? The sight alone of the animals which have been created for our use is sufficient to make us blush with confusion. Let us not receive these benefits with an insensible heart. In all the gifts of nature, let us taste and see that God is good, and ever use his mercies with a heart penetrated with gratitude. "The earth presents itself to our eyes, as the domain which thou hast assigned us; every surrounding object of which was made for our use! Lord, what is man, that thou art mindful of him? and the son of man, that thou thus carest for him? Though he be a little lower than the angels, yet he is thy child. Thou makest him a partaker of thy happiness; thou crownest him with glory and honour; thou hast put all things under his sway; and the whole creation honours and acknowledges him for its monarch. The fierce bull, whose bellowings are heard from afar; the gentle sheep; the wild beasts which traverse and adorn our forests; the fowls which people the air; and the shoals of fish which fill the rivers and the sea; all are obedient to his will, and all were created for his use."

## DECEMBER V

## THE FORMATION OF SNOW.

Snow is a species of hoar-frost, differing only in this, that the hoar-frost falls in the form of dew on the surface of certain cold bodies, which attract its humidity, and to which it remains fixed; whereas snow is formed before it falls, by congealed vapours in the middle region of the air; which vapours follow the same laws, in falling, as fogs, dew, and rain. The air is often excessively cold; and this cold may sometimes be considerably increased by the density of the atmosphere, and by the accession of acid vapours. It is, therefore, easy to comprehend how the aqueous particles become congealed. But perhaps the clouds, more than any thing else, contribute to give this freezing property to the air; for, in general, every snowy day is a cloudy one; now, the denser the clouds are, the more they intercept the sun's rays, and prevent their action. In consequence of this, the cold may become intense enough to cause the vapours to lose their fluidity, and convert them into snow. But, for the same reason, should we not sometimes have snow in summer? It may undoubtedly happen, that even in the midst of summer snow may be formed in the higher regions of the atmosphere. But it is never sufficiently cold in this season to prevent the icy particles from melting in their passage through the lower regions of the air; therefore they cannot appear to us under the form of snow. But this is not the case in winter, as it is then very cold, even in the lower regions of the atmosphere, and on the earth's surface; and as the congealed vapours cannot receive in their fall sufficient warmth to melt them, they continue to preserve their snowy form.

The shape of the flakes is very remarkable. They generally resemble little stars of six equal rays. It is difficult to assign a reason for this regular figure. Perhaps the cause ought to be sought for in the saline particles which float in the air, and which, becoming united to the snow, cause it to crystallize; and then the

congealed vapours assembling round these saline particles, which serve them as a sort of nucleus, they assume the hexagonal form. When the lower air is very cold, these little stars fall separately; but when the air is more temperate or moist, they melt a little, and coming into contact, freeze together, and thus form flakes of different sizes, according to the number of stars which happen to meet together. This is the reason why the snow never falls in large flakes when the cold is intense.

An attentive observer cannot help admiring the divine power and wisdom, when he considers that the most exact proportions and the most perfect regularity are attended to, even in the formation of the particles of snow! How great would our surprise be, were we to see them for the first time, and be told that this brilliant meteor was owing to some vapours in the atmosphere! How suddenly does that snow with which we are encompassed fall, without our having foreseen it! What a multitude of flakes fall from the atmosphere, throng one another, and in a few minutes cover the ground! While this presents a pleasing object to the eye, and abundant matter of reflection to the mind, it is well calculated to justify what the pious Brookes has said: "Frost and snow have their charms, and the winter its sweets. Pure and innocent pleasure can never be unknown, except to those stupid men who reflect upon nothing, and pay no attention to the works of the Lord."

## DECEMBER VI.

### WINTER PLANTS.

It is a mistaken opinion, that winter is in general destructive to plants and trees. On the contrary, it is certain that the variations of heat and cold contribute much to the propagation and increase of vegetables. In warm climates, there are immense deserts, which would be still more barren if cold did not succeed to the burning heats. The winter, far from being prejudicial to the fertility of the earth, favours and increases it. Cold countries have, notwithstanding their snows and frosts, plants which thrive well. A great many trees, as, for

example, the fir, the pine, the juniper, the cedar, the box, and the larch, grow as well in winter as in other seasons; and this was necessary, that the forests might furnish us with a sufficiency of wood and fruit. House-leek, stone-fern, sage, marjoram, thyme, lavender, dwarf wormwood, and other similar plants, preserve their verdure during the winter. There are also certain flowers which grow under the snow. The single anemone, the early hellebore, the cowslip, the primrose, the winter hyacinth, the narcissus, the snow-drop, and all sorts of mosses, grow green, and flourish in the cold. Botanists assure us that the plants of the frigid zone, if put in a greenhouse, cannot bear a heat of more than thirty-eight degrees; that they bear the cold so well, that they grow in Sweden during the winter, as well as in most parts of France, Germany, Russia, and the northern parts of China. Vegetables of excessively cold climates cannot resist the heat; nor can those which grow on the tops of very high mountains in any country. Mountains and rocks whose tops are covered with snow during the whole year are not without their peculiar plants. On the rocks of Lapland many of those vegetables grow which are found on the Alps and Pyrennees, on Mount Olympus, and in Spitzbergen, but nowhere else. When they are planted in a garden, they grow very tall, but bear little fruit. Few of the plants which thrive best in the northern countries can come to any perfection without snow.

Thus, in the vast garden of nature, there is no soil which is entirely barren. From the finest mould to the hardest rocks, from the warmest countries under the line to the coldest climates of the north pole, there is no kind of soil but what produces plants peculiar to itself. And there is no season absolutely without flowers and fruit.

Merciful Creator! permit us not, even in this severe season, to forget thy paternal care; and let us not close our eyes to the blessings which thou hast so liberally bestowed upon us! Were we as attentive as we should be to the government of thy divine providence, we should at all times, and in all places, find motives sufficient to induce us to remember with gratitude the wisdom and

goodness of thy conduct towards us. Nature is never either idle or barren ; in all seasons it continues its labour. Grant, gracious God, that it may be the same with us in every stage of life ! And should we be permitted to arrive at old age, let us neither be unfruitful, nor un-instructive to the world !

## DECEMBER VII.

### AN EXHORTATION TO REMEMBER THE POOR DURING THE SEVERITY OF THE WINTER.

You who are sitting quietly in convenient and comfortable apartments, who hear the keen north wind whistle round your dwellings, reflect on the state of many of your unhappy fellow-creatures, who are at present suffering the utmost severity of cold and poverty. "Happy they, who in this rigorous season have a house to shelter them, clothes to keep them warm, wholesome bread and the fruit of the vine to cheer and strengthen them, and a soft and comfortable bed on which they may rest, and enjoy pleasing dreams. But unhappy the poor man, to whom adversity refuses the necessary shelter ; without clothing to keep him from the cold ; often extended on a bed of sorrows, and too modest to make his necessities known." How deeply should we feel the misery of such people ! Let us attend to those objects of compassion who come to our doors ; how many are feebly crawling through the streets, tormented with hunger and cold ! How many old people, with scarcely enough to cover their shivering limbs ! Exposing themselves for hours together to all the inclemency of the season, in order to solicit the smallest donation from those who pass by ! How many sick people are there without food or medicine ; lying on beds of straw, in miserable cabins, cellars, and garrets, where the wind, the cold, and the snow are their principal visitants !

Winter renders charity to the poor still more necessary, because in this season their wants are increased. Is not this the time when even nature itself is impoverished ? And will it not add a double value to our bene-

factions, to distribute them seasonably? If the summer and autumn have enriched us with their produce, is it not that we might share these blessings with our brethren, now that nature is at rest? The more the cold increases, the more we should be disposed to relieve the necessitous; to pour into the bosom of the indigent a part of the surplus which we have amassed. What other intention could Divine Providence have in its unequal distribution of worldly good, but to put it into the power of the affluent to feel for and relieve the necessities of their fellow-creatures?

Let us have pity therefore upon the poor, and not permit them to suffer even more than the brutes do! It is our duty to mitigate their sufferings: Providence has condescended to grant us that honour. Let the rich understand that it is their duty and privilege to feed, clothe, warm, and cherish the distressed; to support them in their sufferings, and to snatch them from death. Let those who have abundance spare of that abundance; and let those who have but little give of that little. One can scarcely be so poor as not to be able to do some good. Let us taste the sweetest satisfaction that a noble mind can feel, the divine pleasure of providing for the necessities of the poor, of sweetening to them the rigours of winter, and lessening the pressure of adversity. Who can withhold from himself the consolation of relieving the wants of the destitute, which in so many cases may be so easily effected? We need only retract a few of our expenses in food, raiment, and pleasures. What a blessed offering would this be to God, were our beneficence to be accompanied with a victory over our passions, in retrenching the expense occasioned by luxury and vanity, in order to apply it to the relief of the poor!

Let each strive, during these winter days, to relieve, as far as he possibly can, the misery of his fellow-creatures. Let our comforts and conveniences cause us often to think of those who are destitute of the greater part of the sweets of life. In comparing our situation with that of others, we shall feel more powerfully our own happiness, and bless God with redoubled fervour for the great comfort we enjoy. Then, if the charitable disposition of

our heart be not depraved by the world, or corrupted by passion, we shall be led to make as many happy as we possibly can, and to alleviate those ills which we cannot entirely cure. We should frequently ask ourselves: What are the comforts which we desire in this inclement season? They are the very same which we should, if possible, procure for our indigent brethren. Do we know any who have not sufficient clothing to preserve them from the cold: if so, should we not employ that part of our garments which only minister to luxury or pride, to clothe or procure clothing for them? Do we sleep on a comfortable bed, while so many of our fellow-creatures are without any? Should we not then be willing to lie less comfortably, in order to procure the restless and destitute some refreshing sleep? Do we feel the cheering warmth of a comfortable dwelling? Why then should so many others shiver with cold? Should we not make use of the most effectual and speedy means in our power to alleviate their distresses, and to sweeten the bitterness of their lot?

## DECEMBER VIII.

### NATURE IS A SCHOOL FOR THE HEART.

IN every respect the study of nature is profitable; with propriety it may be called a school for the heart, seeing it, in a certain sense, teaches us the duty we owe to God, to our neighbour, and to ourselves.

Can anything inspire a deeper veneration for the Supreme Being than the reflection that it is he who has not only formed the globe of the earth out of nothing, and suspended it in the empty space with all the creatures it contains, but whose mighty hand also confines the sun in his place, and the sea within its shores; can we humble ourselves too much in the presence of that Being, who has created the innumerable worlds which roll above our heads? What despicable creatures are we, when compared with those immense globes! And how mean does the earth and all its glory appear, when considered in this point of view! Should we not shud-

der at the bare thought of offending this God, whose unbounded power every moment meets our eyes ; and who can with one look destroy us, or render us the most miserable of all his creatures ! But the contemplation of nature is also blessedly calculated to fill us with love and gratitude to its Author. All nature, with a loud voice, proclaims this consolatory truth—**GOD IS LOVE**. It was this love that induced God to manifest his glory in the creation of the world, and to communicate to other beings a portion of that felicity which himself enjoyed. On this account he created the universe, and an innumerable multitude of beings, that all, from the archangel to the worm, might prove, according to its nature and capacity, and might feel the effects of the Divine goodness. Is there a creature which does not exhibit proofs of this amazing goodness ?

But we ourselves are particular instances of it : the Creator has endued us with reason, not only to enable us to enjoy his benefits, but to acknowledge and feel that love with which he has honoured us, and which infinitely increases the value of all his blessings. He has decreed that man should rule over the animals, and make them subservient to his wants and conveniences. It is for us the earth produces fruit in such abundance. From him we receive those innumerable daily benefits, to which we owe the continuance of our lives. His love is disinterested ; for he can receive nothing from his creatures ; his felicity can admit of no increase. Can these considerations fail to affect us, to excite our gratitude, and to engage us to return love for love to our beneficent Creator ? Lastly, the contemplation of the universe, and the perfections of God, which are manifested in it with so much splendour, should naturally increase our confidence in him. How great should our tranquillity be, when we consider that our lot is in the hands of that Being, of whose power, wisdom, and goodness we have as many proofs as we have creatures before our eyes ? Can there happen any perplexity, embarrassment, or danger, from which we cannot be delivered by the hands of him who stretched out the heavens and formed all his creatures in so admirable a manner ? And need anything prevent us from having recourse to him in all our necessities and



tribulations, with the full assurance that he will hear our prayers?

Is it possible for mean and selfish sentiments to lodge in the heart of that man, who, in contemplating nature, discovers everywhere the footsteps of the infinite beneficence of that great Being who does not propose less the particular happiness of each individual, than the general good of the universe? Even a superficial contemplation of the ways of providence must deeply impress the mind with a sense of the goodness of God, and his tender concern for all that exists. And the heart must be extremely depraved, which, under a conviction of this universal beneficence of the Creator, is not inspired with the determination to imitate him. Should we not, according to the divine example, feel sincere good will to all his creatures. "God causeth his sun to rise on the evil and the good, and sendeth his rain on the just and unjust." Can we then exclude any from our charity, or be partial in the distribution of its effects? God loves the little as well as the great; the poor as well as the rich; and he does good invariably to all. If, therefore, we wish to imitate our heavenly Father, should we not endeavour to get a love as general and disinterested lighted up in our hearts?

Finally, when we contemplate the admirable order and harmony which reign through all nature, should we not be led to pray that the dispositions of our minds might resemble it? If we be well convinced that nothing can please God which is not according to order, should we not apply ourselves with all our power to be conformed to his will? How despicable should we be, even in our own eyes, if through our fault we produce any derangement in the admirable plan of nature? God wills our perfection: should we not feel ourselves obliged to be conformed to his merciful designs; and in order to this, make a proper use of every mean which nature and grace have afforded us? This should henceforth be our great, our principal occupation. As often as we discover any irregularity in our hearts or ways, we should incessantly labour to have it corrected, and thus be workers together with the saving influences of the Spirit of God.

Thus nature may become an excellent school for the heart. Should we not be attentive to its instructions, and profit by them in a teachable spirit? Here we may learn true wisdom, that wisdom which is never accompanied with disgust or irksomeness; we may learn to know God, and find in this blessed knowledge the foretastes of paradise. Thus our days may pass sweetly away, till we are introduced into that world where we shall no longer be confined to the first rudiments of science, but where our knowledge and holiness shall be more and more perfected through all eternity.

*Note.*—The above may do very well in its place, but without the assistance of divine revelation, no man can thoroughly know the only true God, and Jesus Christ whom he has sent, whom to know, as the Scripture has revealed him, is life everlasting.—A. C.

## DECEMBER IX.

### THE DIVINE GOODNESS MANIFESTED TO US, EVEN IN THINGS WHICH APPEAR HURTFUL.

Most people wish that they were not exposed to any evil in this world. If they had their choice, and could dispose their lot at pleasure, they would endeavour to secure to themselves a life exempt from all kinds of trouble and affliction. But is it really true that we should certainly be happy, if nothing happened to disturb our worldly prosperity and repose, and that we should, during the course of our lives, be exempt from all disagreeable occurrences? This question, on the decision of which our happiness here below so materially depends, deserves to be examined with care, at the same time guarding as much as possible against the illusions of self-love.

Should we be really happy were we to enjoy uninterrupted prosperity in this world? I think not. Constant prosperity will soon grow insipid; and disgust would change our felicity into real misery. On the contrary, the evils which we sometimes suffer enhance the value of our blessings, as colours are relieved and set off by

shades. Were there no winter, could we be so affected as we are by the charms of spring? Can we know the value of health without sickness, the sweets of rest without the pains of labour, the peace and consolations of a good conscience, if we had never been tempted and tried? The more obstacles are opposed to our happiness, the greater is our joy when we have been enabled to surmount them. The heavier our calamities are, the more happy we feel when delivered from them; and the satisfaction which, in such cases, we often feel, makes us shed tears of joy. Besides, if the afflictions of which we complain did not happen, we should certainly be exposed to incomparably greater evils. If all our days were prosperous, we should soon be lost in pride, luxury, and ambition. If we were never pressed by want, none would take the trouble of being active and laborious in his vocation. None would exercise his talents, or cultivate his mind; and none would be animated with zeal for the public good.

If we were never exposed to danger, how should we become prudent, and how could we learn to feel for those whose lives are exposed to danger? Had we no ills to apprehend, intoxicated with prosperity, we should easily forget gratitude to God, charity to our neighbour, and all our duties in general. Are not then these virtues, these mental accomplishments, a thousand times preferable to a continual train of agreeable sensations from outward prosperity, which would soon appear dull and insipid, because uninterruptedly enjoyed? "He who always reposes in the lap of prosperity soon becomes backward to all good, and incapable of performing any great action; but let him feel the strokes of adversity, and he will return to wisdom, activity, and virtue."

How unjust and inconsistent are the desires of men! They wish to live quiet, contented, and happy, and are discontented with the means which lead to the accomplishment of their own desires! In the heats of summer we pant for the refreshing breeze, and yet we are displeased with the storm that cools and refreshes the air. Thunder purifies the atmosphere, and renders the earth fruitful; yet we complain that the flashes of lightning terrify our minds. We acknowledge the use of

coal, sulphur, minerals, and warm baths, but we do not like earthquakes. We wish that there were no contagious nor epidemic disorders, and yet we complain of those tempests which prevent that corruption of the air which produces them. We wish to have servants, and yet we desire that there should be neither poverty nor an inequality of station in the world. In a word, we wish to have every end accomplished, without the use of the means which lead to it.

Acknowledge, O man, the wise and beneficent designs of thy God, even when he permits thee to feel the frequent vicissitudes of joy and sorrow, of prosperity and adversity. Is he not the Arbiter of our lot; the Master who can punish or reward; the Father, from whose tender love even our chastisements themselves must come? Are we not in a world, one peculiar characteristic of which is, to be subject to continual changes and revolutions? Have we not often found, in the course of our life, that what our ignorance considered as an evil, really contributed to our true happiness? Let us therefore receive with meekness from the hand of God those afflictions which he thinks proper to dispense. They appear dreadful only in their beginnings; but the more we are exercised by them, the more supportable we shall find them, and experience their most salutary effects. If in adversity we have faith and patience, we shall in the end be enabled to bless God for the afflictions he has sent us. However it may be, we shall certainly bless him in eternity for all our sufferings. There we shall form a different judgment of the troubles we have passed through here below. We shall then see that without the afflictions of which we now complain we should never have arrived at that state of felicity which God has designed for us. "There, our complaints and our sorrows shall cease for ever. There, transported with gratitude and joy, we shall offer songs of praise and thanksgiving to God, for all the afflictions we have patiently suffered here below. There we shall exclaim, in holy ecstasy, All is finished, all is well! God has done all things in infinite goodness and mercy."

## DECEMBER X.

## CASUAL REVOLUTIONS ON OUR GLOBE.

NATURE of itself is completely producing changes on the surface of the earth, which have a great influence on the whole globe. Many ancient monuments prove that in various places its surface sinks down, at some times suddenly, at others gradually. The wall built by the Romans, in the second century, between the river Forth and the river Clyde, across Scotland, is at present almost entirely buried under ground, remains of which are daily discovered. Mountains, those pillars of the earth, are exposed to similar ruin, occasioned sometimes by the nature of the soil, at other times by water, which sap their foundations, and lastly by subterranean fires. But if some parts of the globe sink down, others on the contrary become more elevated. A fruitful valley, at the end of a century, may be converted into a marsh, where clay, turf, and other substances form layers upon each other. Lakes and gulfs are converted into dry land. In stagnant waters, rushes, weeds, and different plants grow; animal and vegetable substances putrefy in them, and gradually form a kind of mud and mould, and the bottom rises up so, that solid earth takes the place of water.

Subterraneous fires, also, produce great changes on our globe. The effects are perceived by three different commotions, which are generally felt separately, but which sometimes come all together. The first consists in a horizontal motion forwards and backwards. When these oscillations are violent and unequal, they throw down buildings, and change the surface of the ground. This kind of undulatory motion may be easily discerned in the water. There are other earthquakes, called shocks or tossings. These sometimes cause new islands to arise suddenly from the bottom of the sea. The outward crust of the earth being violently pushed up, falls down lower than before, breaks into chasms, and thus forms lakes, marshes, and springs. Lastly, there are explo-

sions similar to those of mines, accompanied with inflammable matter. These violent shocks and convulsions often cause great devastations, and make considerable changes on the surface of our planet. The outward crust of the earth cleaves in different places, sinks on one hand, and rises on the other. The sea partakes of these commotions ; but the most sensible effect which we perceive in it is the formation of new islands. They are produced by the elevation of the bottom of the sea, or are composed of pumice-stones, calcined rocks, or other matters projected from volcanoes. History informs us, that through earthquakes, produced by subterranean fires, whole cities have been swallowed up, and buried sixty feet deep, so that the earth that covered them became afterwards arable ground.

Many other alterations, produced on our globe, have been occasioned by the motion of the waters. Heavy rains soak into the mountains, and wash away a great deal of earth, which, being swept down into rivers and into the sea, raise the bottom of them considerably. Rivers also change their course ; coasts themselves are sometimes displaced. Sometimes the sea retires, and leaves whole countries dry, which were before its bed ; at other times it gains on the land, and whole districts are inundated. Places which were formerly contiguous to the sea, are now a great distance from it. Anchors, and vast iron rings to moor vessels, and the remains of ships, which are found on the mountains and marshes, at a great distance from the sea, incontestably prove that many places formerly covered by the sea are at present solid land. There is every appearance that England was once joined to France ; the beds of earth and stone which are the same on each side of the strait between Dover and Calais, and the shallowness of the sea between those two places, seem strong indications of this. Climates also produce great alterations on the globe. Between the tropics, the heats and rains are alternate. In some places it rains for several months together, and at other times the heat is excessive. The countries in the vicinity of the pole undergo great changes, through the intenseness of the cold. In autumn the water penetrates through a multitude of little crevices in the rocks and mountains ; there

it freezes in winter, and the ice, dilating and bursting, makes great havoc.

Such revolutions, produced by accidental causes, are palpable proofs of the frailty of the earth itself. They prove, also, that God is not an idle spectator of the alterations which take place on our globe, but that he has arranged, and continues to direct, everything according to infinitely wise laws. Hence we may also learn that all things here below are subject to continual vicissitudes. We even see that frequent accidental revolutions cause, not only the inanimate, but all the animate world to assume a new appearance. One generation disappears, and gives place to another. Some rise to dignities and honours, while others fall into misery and contempt. There are continual changes and migrations among the different creatures; and various gradations in their condition and faculties. God has allotted to all beings different periods of duration; some are appointed to a short and momentary existence, others to a long life, and others to an endless duration. In all this, how evidently do the wisdom, power, and goodness of the Creator shine forth!

## DECEMBER XI.

### GRATITUDE FOR OUR CLOTHING.

PROVIDENCE manifests itself even in our clothing. How many animals give us their hair, wool, fur, or skins to cover us! The sheep alone, with its wool, furnishes the most necessary part of our dress; and it is to the valuable labours of a worm that we owe our silks. How many plants also serve for the same purpose! Hemp and flax furnish us with linen; and many different stuffs are made out of cotton. But these vast stores of nature would not have been sufficient, had not God endowed man with industry and an inexhaustible fund of invention, and given him hands capable of preparing clothing of different kinds. Let us only reflect on the labour requisite to produce one piece of cloth, and we shall see

that it demands the united exertions of a multitude of hands to prepare even a few yards. How little cause have we to be vain of our dress, seeing we are obliged to have recourse to the most despicable animals for the materials out of which it is made, and to that class of people as workmen which our pride despises the most.

But why has the Creator laid us under the necessity of providing for ourselves, while all other animals receive theirs immediately from nature? I answer: This obligation is very advantageous to us; on one hand, it is favourable to our health; and on the other, it is suited to our manner of life. We can thus regulate our garments according to the different seasons of the year, the climate where we live, and particularly according to the situation or profession we have chosen. Our garments promote insensible perspiration, so essential to the preservation of our life. The necessity of procuring them ourselves exercises the mind, and gives birth to the invention of many arts; and lastly, the labour they require provides subsistence for a multitude of workmen. We have therefore the utmost reason to be satisfied with this arrangement of Providence. Let us only take care not to forget its design in furnishing us with clothing. A Christian should not seek his glory in the outward ornaments of his body, but in the virtuous dispositions of his soul. The proud person assumes a thousand different forms, and inwardly glories in the most frivolous advantages, attributes excellencies to himself which he has not, or rates too highly those which he has. As to the outside, some show their pride in the splendour of silks, gold, and jewels; whilst others nourish it under rags. The true Christian avoids both these excesses. The first is supremely foolish; for it is degrading to human nature to seek glory in outward ornaments. We wear clothes to preserve our bodies from the intemperature of the air, a precaution which the weakness of man, since his fall, has rendered necessary, not only for health and decency, but also to distinguish the sexes, and to establish those distinctions which are necessary in the different orders of society. These are the rational ends for which our garments have been designed, and we should use them only for the fulfilment of these designs.



Let us reflect a little on the state of many of our fellow-creatures, who have scarcely clothes to cover them. Alas! how many are there around us who are but half clothed, and in these severe winter days can scarcely shelter themselves from the cold! Let the sight of these miserable people cause us to have a lively sense of the Divine goodness, which has enabled us to provide for ourselves with the necessary clothing. As many of those who may read this paper may have clothing in abundance, let them remember that there are many very near them who can scarcely provide themselves a single coat! O ye rich! it is your duty to clothe the naked, and to be unfeignedly thankful to God for the abundance he has given you.

How should we bless our Preserver for the benefits in this respect we have received from his hands! How many suits have we received, how many worn, and how many cast off, from our infant state, until now! In this, also, how has God united the useful with the necessary, and the pleasing with the useful! Let us return him thanks for his goodness; and beseech him so to instruct our hearts, that our clothing shall never render us guilty of pride and vanity; that we may delight to clothe the poor, and learn how to unite kindness to humility, and avoid superfluities. Let us learn to get our souls adorned with holiness, seeing this alone, in the sight of the Lord, is of great price. By and by, a shroud shall be our last covering. May God grant that at that time we may be found clothed with salvation, that an abundant entrance may be ministered unto us into the everlasting kingdom of our God and his Christ.

“Yes, O Father, thou wilt provide! Thou well knowest the necessities of thy children. I will trust in thy goodness, O thou who powerfully supportest the weak! My hope, O Lord, is all in thee. Let my faith be increased, and my love perfected, day by day!”

## DECEMBER XII.

## THE CLOTHING OF ANIMALS.

It is a wonderful proof of Divine Providence, that all animals should be naturally provided with coverings the best suited to their several habitations and manner of life. Some are covered with hair, others with feathers; some with scales, and others with shells. This variety is a sure proof that a Wise Artist has prepared the clothing of animals; as it is not only adapted in general to the different kinds, but appropriated also to each individual. Hair is the most convenient clothing for quadrupeds. Nature, in giving it to them, has so formed the texture of their skin, that they can, without inconvenience, lie on the earth in all kinds of weather, and be employed in the service of man. The thick fur of some animals not only preserves them from wet and cold, but serves also to cover their young, and provide them with a soft bed. For fowls and certain insects, feathers are the most convenient covering; for they not only protect them from cold and wet, but are so disposed as to support them in the air. On this account they are spread over the whole body, and their delicate texture is peculiarly favourable to flight. They are light and hollow, and their tubes are filled with a marrowy substance which strengthens them; and the capillary filaments, interwoven with so much art, render them thick enough to endure the heat of the body, preserve them from the intemperature of the air, and give the wings a proper degree of strength.

The clothing of reptiles is perfectly adapted to their manner of life. Observe, for instance, the earthworm. Its body is formed only of a series of little rings, and each ring is provided with a certain number of muscles, by means of which, the body may be greatly extended or contracted. These creatures have a sort of glutinous juice under their skin, which is perspired, and covers the body with a gluey substance, which enables it to slip the

better through the earth, which it could not do were it covered with hair, feathers, or scales.

The substance which covers aquatic animals is not less suited to the element they dwell in. Fish could not possibly have more convenient clothing than scales : the form, size, substance, number, and situation of which are perfectly adapted to the peculiar manner of life of these animals. Nor could shell-fish be better clothed or better lodged than they are.

That which is particularly remarkable here is, the beauty of these different coverings. The most deformed beasts, whose appearance is the most disagreeable, have in this respect their beauty. But to the principal part of birds and insects God has dispensed ornaments with the most liberal profusion. Let us only fix our attention on the butterfly ; its beauty must excite our surprise and admiration. Many of these animals have but simple clothing, and are all of one colour. Others are sparingly ornamented, and others shine with the greatest variety of the most splendid colours. How greatly has nature diversified the beauty and plumage of birds ! The little colibri, or humming-bird, an inhabitant of America, is one of the wonders of nature ; it is not larger than a great fly, but the plumage is so beautiful that its neck and wings resemble the rainbow. Its neck is of a bright ruby red ; under the belly and wings it is as yellow as gold ; the thighs are as green as an emerald ; and the feet and beak polished, and as black as ebony. The males have a little tuft on their heads, composed of all the colours which adorn the rest of the body. These are worn as pendants in the ears of the women in Mexico.

It is impossible not to be convinced, that God, in creating birds, had their conveniency, utility, and beauty particularly in view. Every animal has that kind of dress which is most suitable, and it would be imperfect were it clothed in any other way. There is nothing wanting, and nothing superfluous ; and everything is so well arranged, and finished in such a masterly manner, that no human industry or skill can equal it. Does not all this demonstrate the existence of a Being who has all the treasures of wisdom and knowledge, joined with an

unbounded goodness ; who has determined to render each creature as happy as is consistent with its nature, and the end for which he has formed it ?

## DECEMBER XIII.

## THOUGHTS ON THE RAVAGES OF WINTER.

I HEAR the winds and tempest roar, and my blood freezes in my veins. The gloominess of the day ; its almost extinguished light ; a disposition in myself to terror and dismay ; all concur to render the tumult and disorder which prevail in nature still more dreadful. How often does the wind overturn cottages, and even palaces ; and thus, the labour of years is in an instant destroyed. How often have ships, and the unhappy persons who hazarded their lives on the brittle vessel, been precipitated into the yawning abyss ! How often have the sturdy oaks been torn up from the roots ! Yet thou, O Lord, art the Author and Ruler of the storm : the north-wind and the tempest are thy messengers, the heralds of thy power, and ministers of thy will. They should lead us to fear and adore thee. Didst thou not set bounds to their destructive power, they would everywhere and at all times occasion the same devastations. Yet the poor cottage, notwithstanding the violence of the storm, is still preserved, though unsheltered from the rude blast. Thanks be given to that powerful Being, whose voice silences the winds and the waves. His wisdom has ordained all for the best.

“ But if the world and all events are his work, and the effect of an infinite wisdom, how can confusion, desolation, and ruin, occasioned by tempests, be permitted to take place ? Can perfect wisdom produce anything but order ? And can perfect goodness design any end but what is good ? ” Thus thou inquirest, O man ; but what art thou, to dispute with God ? Shall the creature say to his Creator, Why hast thou made me thus ? But does it follow, because we cannot comprehend and explain everything, that there are any defects in the works of the Lord ? To be able to judge of his works,

and the ends he has proposed, we must be equal to him in wisdom and understanding. It is indeed a real miracle that we are capable of perceiving even a little of the order which he has established, of comprehending a part of the wise and extensive plan which he has executed ; and, considering the darkness of our understanding, it is astonishing that things do not appear still more confusedly to us ! Alas ! all would be disorder and confusion ; order, harmony, and happiness could not exist in the universe, were there not a Being whose wisdom, goodness, and power infinitely surpassed our conceptions ; a Being who has created the world and all that it contains. All the light, goodness, and felicity which are found in the world, prove the wisdom and goodness of our Creator. And as the general arrangement and ordinary course of nature visibly tend only to the good of the creatures, whatever particular accidents may appear contradictory to this design, they prove only our ignorance, and the limited state of our understanding. To make one whole, out of all the materials of which the visible world is composed, where so many magnificent phenomena are produced, where the various beauties and treasures of light, virtue, and felicity are displayed before our eyes, is a work so marvellous and divine, that none but a being of infinite wisdom, power, and goodness could have conceived the idea, or executed the plan.

The more we advance in our researches in nature's works, the more clearly we discern that wisdom and goodness which have created and which govern the whole. After having laid down these principles, we shall think differently from what we have done of the ravages of winter. Even the tempests, the snow, the frost, and all that appears disagreeable at this season, are linked together in the eternal order of things. Each thing has its season, and comes at the determined time ; and by means of all these revolutions the divine wisdom preserves the harmony of the immense whole. The wind, which terrifies the mariner at sea, carries water to dry barren lands. The sulphureous vapours, salts, and other matters, driven by the wind from one country to another, revive the earth, and restore fertility to the

fields, covered with stubble, which frequent crops had exhausted. Thus, the winter, which appears so destructive, enables our fields to produce new crops.

At present, the ground, the gardens, and the seeds rest, buried under the snow and ice. The inhabitants of the forests howl more hideously than usual. The beasts are oppressed with hunger. The whole world appears dead. But the Lord preserves the world under this apparent death, and watches our perishing nature. What miracles are wrought in the midst of these terrifying scenes of winter! He feeds and supports the poor; the sparrow which can now no longer find food, lives notwithstanding, in the place of its retreat, on the gifts of God's beneficent hand. The earth, whose fruitful bosom is now shut up, provides no more food; but his hand, which is ever open, provides the necessaries of life, and he calls into being the things which do not as yet exist.

"Lord, thou art great! In the most tempestuous seasons thou showest thyself the mild and compassionate Lord. Thou knowest how to prepare us food from snow and ice; and to enable man to shake off the yoke of pinching cold, thou endowest him with understanding and industry. Thou clothest the naked; thou strengthenest the weak; they live and are prosperous. Teach us to seek thy face, and ever to acknowledge thee as the friend and benefactor of mankind. May thy goodness kindle a holy love in our hearts; such a love as feels no difficulty to extend itself to our most cruel enemy; so that we may clothe him when naked, feed him when hungry, and dry up his tears in the day of his distress! It is right that the world should be ever governed by the eternal laws which thou hast prescribed. When, for thy sake, the poor man shares his morsel with him who is utterly destitute, condescend to compensate his labour of love. Thy purpose is everlasting. While time shall endure, summer and winter, seed-time and harvest, shall succeed each other, and thy blessing shall rest on the whole creation."

## THE ORANG-OUTANG.

THE great interval which separates man from the quadrupeds is filled up by the ape, and by those animals which bear the nearest resemblance to the ape, the species of which are very numerous and intimately blended. Leaving those which approach nearest to quadrupeds properly such, we insensibly arise by a variety of gradations to a principal and superior species, which has so near a resemblance to the human race, that, from this circumstance, it has received the name of Orang-Outang, or Wild Man.

If the elephant appear to resemble man by intelligence, the orang-outang bears a nearer resemblance to him, not only in his external and internal structure, but also in his inclinations and habits, and the various talents which result from them.

The orang-outang resembles the human being so much, that the anatomist who compares them seems to compare two individuals of the same species, or, at least, of the same genus, so that, struck with the numerous and decisive similitudes which he discovers between these two beings, he does not hesitate a moment to place the orang-outang immediately after the Hottentot.

This animal, the chief and largest of the ape kind, appears in effect to possess all the attributes of humanity, if we except only that grand and most distinguishing characteristic of man, which no other animal shares with him, and which gives him a decided superiority over all—reason and speech. The orang-outang does not speak; therefore he does not think, for speech is necessary to thought. He has, notwithstanding, all the exterior organs of speech; and on dissection, his brain appears perfectly to resemble that of man: yet something in the number, figure, or arrangement of the particles of matter in the brain, which corresponds to the human voice, must be wanting. This animal has not the capacity of connecting his ideas with those articulate sounds which represent them; nor of associating or combining them in that infinitely diversified manner which is so evident

in man. But though the orang-outang be not man, yet he is, at least, the most perfect similitude of man on the face of the earth. Indeed this similitude is so complete, that the female has the same periodical evacuation as the female of the human species. The male is sometimes as tall, and rather lustier than man. Like him, he walks upright, using a staff for the purpose, which he procures for himself; and which he can use well, either in case of self-defence, or in attacking his enemy. With astonishment we behold him taking his place at table among the guests, unfolding his napkin, and using his knife, fork, and spoon, in the most proper manner. He pours out the liquor into the glass; touches glasses with any of the company when desired; wipes his lips with the napkin; lays the cup and saucer on the table, puts in the sugar, pours out the tea, and then leaves it to cool before he attempts to drink it: finally, shakes hands with the guests, or walks out gravely along with them.

We are not less surprised to see the orang-outang lie down in the bed which he himself has previously made, place his head upon the bolster, bind it with a handkerchief, adjust the clothes on him, &c. One who in sickness had been twice bled in the arm, when afterwards afflicted, presented his arm, as if desirous of being relieved by the same treatment.

Very susceptible of instruction, the orang-outang makes a good servant, and will readily obey either signs or words. If brought up to domestic service, he acquits himself with great propriety and exactness in the different functions assigned to him; rinses the glasses, brings drink, turns the spit, pounds in a mortar whatever is given him to pound, goes to the well for water, fills his pitcher, places it on his head, brings it home, &c.

These animals live in society in the woods; they have both strength and courage sufficient to attack an elephant with their clubs, and compel him to retreat. They even dare to attack an armed man. More industrious than the elephant, they understand how to build huts with interwoven branches, properly adapted to their necessities. They are passionately fond of women; pursue



them with vehemence, embrace them when they catch them, feed and take the utmost care of them.

The female is affectionately attached to her young; carries it in her arms; gives it the breast, provides for all its necessities, and defends it with great courage.

I almost scruple to insert here a last trait of the instinct of the orang-outang, which at first view might appear more proper for fable than history; but which we have received from a celebrated traveller, and with which the great historian of nature has not disdained to enrich his work. When the orang-outang finds no more fruits on the mountains, or in the woods, he goes to the sea-coast in search of a very large species of oyster, of several pounds weight, which he often finds gaping on the shore; but the circumspect animal, fearing lest the oyster in closing his shell should catch hold of his hand, very adroitly puts in a stone, which, hindering the shells from closing, permits him to take out and eat the fish at his ease.

How manifold and beneficent is the wisdom of God! What an endless diversity in the works of his hands! Nature never proceeds by leaps; what an enormous distance separates the man from the dog! and yet between the man and dog the links of the chain are uninterrupted. In proceeding along this chain the contemplator of nature arrives at last, with astonishment, at a being so similar to man, that the characteristics which distinguish them seem less to be specific differences than simple varieties! Reader, God has distinguished thee from the animal in question, by reason and speech; he has also given thee an immortal soul; he has made thee lord of this lower world; and rendered thee capable of infinite happiness; submit to him who is Lord of the universe; and devote all thy powers unreservedly to his glory!

## DECEMBER XIV.

SAGACITY OF ANIMALS IN PROCURING THEIR WINTER'S  
SUBSISTENCE.

THERE are some animals which lay up stores for winter, and in harvest-time make provision for six months. It seems as if they foresaw a season when they could not collect food, and made use of this precaution for their future support ; besides, they can calculate exactly what will be necessary, not only for their own consumption, but also for that of their family. Bees are almost the only insects which lay up provisions for winter. They use their wax with astonishing economy, as they know they can collect no more after the season of flowers is over, and have no other resource for their subsistence, and the construction of their cells, than the collection which they have already made. Their prudence directs them to collect another sort of matter, which they need to keep the cold out of their hives ; this is a glutinous substance, which they collect from flowers and bitter plants, and which they employ in stopping up closely every crevice in their hives. Their economy may be seen even in the smallest matters. They waste nothing ; and that which they need not at present they reserve for the future. Those who have carefully examined them assure us, that when in winter they uncover their cells to come at the honey, they carry off the wax with which they were closed, and lay it up for future use.

Among quadrupeds, the hamster and field-mouse lay up provision for winter ; and in harvest-time carry a quantity of grain into their subterraneous dwellings. Among birds, magpies and jays gather heaps of acorns in autumn, and keep them for winter in hollow trees. As to those animals which sleep during the winter, they make no provision ; this to them would be useless. But the others not only provide for the present, but also for the future. Each in the time of abundance provides against the time of want. And it has never been known

that the provisions which they then collected were insufficient for their winter's maintenance.

These economic cares cannot be considered as the fruit of reflection ; as this would be to attribute to them much more intelligence than they really possess. It is probable, that they only think of the present, and of what affects their senses, either in an agreeable or disagreeable manner. And if the present influences them in reference to the future, this is without design, and without their having any knowledge of what they do. How can we suppose that there can be any foresight or reflection in this instinct of animals, seeing they have experience of the vicissitudes of seasons, and the nature of winter ; and that, having no idea of the measure of time, it is impossible for them to know when the winter will come, or how long it will last. Nor can we attribute to them any reasoning, or ideas concerning the future ; nor imagine that they seek the means of subsistence during the severe season from reflection, seeing they ever act in the same way, without any variation ; and that each species follows constantly and naturally the same method without having been previously taught it.

When, for example, the working bees continue to collect that honey and wax with which they fill their hives, as long as the season will permit them, it is not because they foresee that a time will come in which they shall not be able to collect any ; such foresight cannot be attributed to them ; how can creatures which have only sensual perceptions judge of futurity ? But everything has been so ordered that the bees find provision made, notwithstanding they made the collection without design. They are led by Providence to gather wax and honey ; they labour at this during the fine weather, and when winter comes they find their magazines full. These animals, as well as all others, act blindly, and almost mechanically, without reflection or design ; although they appear to conduct themselves according to the wisest and most prudential rules. Therefore, being destitute of reason, this wise economy, these acts of apparent foresight and reflection, which we remark in them, must be produced by a superior intelligence who has thought of

and cares for them, and whose views they fulfil without knowing it.-

In this consists part of our superiority over the brute creation. We can present the past and the future to our minds; we can act from reflection, and form plans; we can determine from motives, and choose what is most suitable. But how necessary is it that we should make a proper use of these prerogatives! Informed as we are of the great revolutions which await us, and being enabled to look forward to the winter of our life, should we not lay up a good store of well-founded hopes and consolations, which might render our latter days not only supportable but happy? No sight can be more afflictive than to see an old man, who in the days of his youth had lived without care or foresight, and who, now that his winter is come, is destitute of all comfort; and whose state is more humiliating because he has deserved it. Let us not act in this inconsiderate manner; but henceforth, after the example of a wise economist, let us ever have the future before our eyes, and prepare for it. Let us, without delay, adopt those measures which may secure our comfort in old age, and our happiness to eternity!

## DECEMBER XV

### THE ADVANTAGES OF WINTER.

LET us reflect on the blessings which God grants us in this rigorous season. The cold and frost retain many noxious vapours in the upper regions of the atmosphere, and purify the air. Far from being injurious to the health of men, they often confirm it, and preserve our humours from that putrefaction which continual heat would infallibly produce. If the exhalations and vapours which collect in the atmosphere were always to fall down in rain, the earth would be too much soaked and softened; the roads would be impassable; our bodies would be filled with humours; their different parts would be too much dilated and relaxed; whereas the cold braces and strengthens them, and promotes the circulation of

the blood. In very hot countries, and in those where the earth is too wet during the winter, obstinate and mortal diseases are more frequent than elsewhere. Travellers assure us that in Greenland, where the country is covered with mountains of ice, and where, during the winter, the days are but four or five hours long, the atmosphere is very wholesome, pure, and light; and, excepting some slight coughs and affections of the eyes (occasioned partly by the quality of their food), maladies common in Europe are seldom to be met with among them. It is certain that the constitution of the human body varies according to the difference of climates; so that the inhabitants of the northern countries have a constitution adapted to the excessive cold which continually prevails there, and their bodies are generally healthy and robust. Even as man, though the love of activity and labour be necessary for him, is nevertheless glad to suspend his labours every evening, that he may taste the sweets of repose, and spend a part of his time different from that in which he was during the day; even so our nature accommodates itself to the variations of the seasons, and is pleased with this variation, because it contributes to our comfort and well-being.

At present, our gardens and fields are covered with snow; and they repose under this covering; and it is necessary to preserve them from the injuries of the cold, to shelter the seed from the impetuosity of the winds, and to prevent it from rotting. Our fields had need of rest, after having produced, during the fine weather, all those fruits on which we subsist during the winter. In this, let us acknowledge the wise bounty of God; if our present support had not been provided for us, if in this severe season we were obliged to till the earth, our complaints would have some ground; but he has replenished our stores with a sufficiency for our present necessities, and we enjoy that rest which is suitable to the season.

How tenderly does Providence care for us in these days of winter! God has endued man with that industry which they require to defend themselves from the cold and frost. Their inventive minds have led them to find out an artificial fire, by means of which they may

enjoy in their chambers some of the comforts of summer. The care of Providence is not less manifest in the yearly produce of wood, and its astonishing increase, than in the fertility of our fields. Besides, we have at this season a multitude of creatures at our command, which make it tolerable. The colder the country is, the more those useful animals are multiplied in it whose fur is designed to keep us warm. Is it not evident that the Divine Wisdom has foreseen the wants of different countries; and that he has provided for them by placing animals there which could live nowhere else? Our beasts of burden bring us the necessary provision; and it is worthy of remark, that our cattle are most prolific when we stand most in need of them.

Winter does not materially interrupt trade or commerce. Rivers in many places are frozen over; and are as solid as brass; the surface being covered with snow, travelling is facilitated; and thus a new means of intercourse is opened among men. Men are not condemned to inaction or idleness during this season; for, if they are obliged to suspend the labours of the field, they have a thousand ways of employing themselves usefully in domestic life. The repose of nature invites them to reflect on themselves. Their attention, it is true, can be no longer fixed on the beauties which spring and summer present to their eyes; but their minds may be so much the more at liberty to reflect even in the darkness of the night on the instability of all earthly things; and these reflections may lead man to consecrate himself unreservedly to the service of that Supreme Being who never changes, and to prepare for eternity. Man may now have leisure, in a quiet retreat, to cultivate his understanding, study his own heart, correct his errors, and acquire power from his Maker to walk uprightly. How wise should we be if we made so good a use of this season! If, during the winter, we can neither cultivate our gardens, reap our fields, nor gather in new fruits, we may at least cultivate our souls, and endeavour to render ourselves useful to our neighbour. However severe the season may be, it may nevertheless furnish us with abundant reason to bless God, to acknowledge his benefits, and to trust in him.

How inexcusable must our ingratitude be, if, wholly taken up with the inconveniences of winter, we forget the advantages and blessings which God condescends to give us in this season! Let these considerations awaken our minds to more equitable sentiments, and excite us to celebrate the loving-kindness of the Lord at all times, and in all seasons.

## DECEMBER XVI.

### THE ELEMENTS.

WHETHER we consider the universe collectively, or examine its different component parts, we shall always find sufficient motives to lead us to admire the power and wisdom of the Creator. It is true that we know things very imperfectly; and that in most cases we can scarcely go beyond conjecture and probability; but this is enough to cause us to acknowledge the greatness of God on the one hand, and the weakness of our reason on the other. Probably, all the elements are of the same nature, and may be reduced to one only; perhaps they are so combined as to form but one whole; but it would be very difficult to consider the elements in this collective point of view; it is therefore necessary to divide them in our minds, and consider the primitive constituent parts of bodies separately.

What various and admirable properties has the air which we every moment respire! With what force does it divide and dissolve all sorts of substances, partaking of the qualities of each! Innumerable vapours and exhalations, and thousands of different odours; so many volatile salts, alkalies, and acids; so many oils and inflammable spirits, which blend and unite with it, render it sometimes noxious, but in general wholesome and good. These foreign matters with which the air is laden, its elasticity, the property it has of being rarefied or condensed, and of reassuming its natural state, produce those agitations in the atmosphere, those meteors which disperse noxious vapours, which purify the earth, and promote the vegetation of plants. And though the

effects of the air may be sometimes terrible, they are nevertheless absolutely necessary to prevent the earth from becoming a frightful desert. But there are in this element, as well as in all the works of the Lord, impenetrable mysteries. Who, for instance, can explain how the particles of air, which are so extremely fine as not to be visible, are, notwithstanding, the very means by which objects become visible to us? What can be more astonishing than that equilibrium between the outward air and that which is within us? A balance on which our very life depends! And who can sufficiently admire this, that one and the same element should be the medium by which sounds, odours, and light should be transmitted?

• There is great conformity between air and water, and its properties and effects are not less various nor less wonderful. How many different qualities has God given to this element! All the abundance and salubrity of the air, all the fertility of the earth, and all the warmth of the fire, could not save us from perishing, were we destitute of water. How many changes is it susceptible of! Who has given it the property of being dilated, divided, and rarefied, so that it can ascend the height of a league in the atmosphere, form itself into fogs and clouds, and continue suspended there? Who has given it power to penetrate plants, to transpire from them through insensible pores, and diffuse itself over our fields and vallies in the form of a refreshing dew? How astonishing is that property which it has of becoming sometimes lighter than air (although a mass of water be nearly 900 times heavier than an equal volume of air); of resuming afterwards its natural weight; of attaching itself to all sorts of bodies; of dissolving the most compact substances; and of uniting itself even with fire!

Of all the elements, we know least of fire; it is too subtile for our eyes; but its virtues, properties, and effects are sensible enough. Whether the essence of fire consist in motion only, or in the formation of what are called inflammable particles; or that it is a simple substance, different in its nature from all other corporeal things (which a number of experiments seem to render very probable), it is nevertheless certain, that its prodi-



gious abundance, its utility, and its wonderful effects deserve our utmost attention. There is no body, however cold, but contains fiery particles, which become sensible when excited by violent friction. Fire exists everywhere. Its presence is universal; it is found in the air we breathe, in the water we drink, and in the earth that supports us. It enters into the composition of all bodies; it pervades their smallest pores; it unites itself intimately with them; it moves with them from place to place; and however enveloped, however confined, it fails not to make itself evident at last. With what force does it dilate the surrounding air; whilst the air in its turn nourishes the fire, and renders it more active and violent. Fire gives water its fluidity, the earth its fertility, health to man, and life to all animals.

Earth, when in a pure state, is distinguished from all other substances, by having neither taste nor smell; by being insoluble both in water and spirits of wine, and by being the most friable of all bodies. At first sight it appears very different from all the other elements; nevertheless it has so many conformities to them, that there have been philosophers who believed that water is nothing but earth saturated and dissolved, and that earth is water thickened and condensed. According to these, the water continually diminishes on our globe, and gradually forms compact bodies; because that formerly our planet was only a wet and fluid mass, and was in more ancient times nothing but water.

All the elements which we have mentioned are absolutely necessary to our existence and preservation; and there is none of them but may fill us with admiration, when we reflect on its wonderful properties, and on the numerous and diversified effects which it produces. With how many properties, different from each other, has God endued his works! How many agents, in heaven and on earth, are continually employed for the preservation of the universe in general, and of each creature in particular! How many revolutions and phenomena are produced by the mere combination of the elements! It would be more easy to reckon up the works of God than the multiplied forces which are still in action. But how great must that Power be from

which all these proceed! They all depend on the will of the wise and almighty Creator. He has formed the whole, and impressed on each its constant, uniform, and beneficial motion. It is God who maintains the elements in that equilibrium to which the world owes its preservation. And to this God be glory for ever and ever!\*

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\* I leave the above paper as I found it, but shall present the reader with a more philosophical account of air, earth, fire, and water, called the four elements by ancient philosophers.

AIR.—Its properties are fluidity, elasticity, expansibility, and gravity.

A square foot of the earth's surface sustains a weight of 2160 pounds of atmospheric air, and a column of air of one inch square weighs about fifteen pounds.

Atmospheric air is a compound: in one hundred measures of it there are 21 parts of oxygen gas, 79 of nitrogen gas; and in every thousand measures about one of carbonic acid gas. The first was formerly termed vital air, the second azotic gas.

EARTH.—Formerly earth was considered a simple substance, and hence called one of the four elements; but modern chemistry has ascertained the existence of nine different earths: silica, alumina, zirconia, glucina, yttria, barytes, strontites, lime, and magnesia. The four last are termed alkaline earths. All the earths are incombustible bodies, and in general unalterable in the fire.

FIRE.—This is now generally termed caloric; it produces what is called warmth, heat, and fire. The latter is the principle of caloric, acting on combustible substances, in the process which is commonly termed combustion; in which a certain product is formed, and what escapes is what we call fire.

There are six sources of caloric. It may be derived from the sun, by combustion; it may be obtained by percussion, by friction, by the mixture of different substances, and by means of electricity and galvanism.

The reader may acquire a tolerably correct notion of it by this circumstance: Place the hand upon a body above your own temperature, and you have the sensation of heat; place it on one below that temperature, and you have the sensation of cold. In the first case, the hotter body imparted a portion of its caloric to the hand; in the latter case, the hand gave out a portion of its caloric to the colder body. The abstraction of a portion of the caloric gave the sensation of cold; the imparting of it in the first case gave that of heat.

Caloric always tends to equalize the temperature of all bodies within its sphere. Coldness always supposes the abstraction of a measure of the natural degree of caloric belonging to a particular

## DECEMBER XVII.

## THE SUN'S INFLUENCE ON THE EARTH.

THE sun is a principal cause of most of the phenomena which take place on the earth. He is the constant source of that light which is so plentifully diffused over our globe. This light of the sun is the most subtile fire; it penetrates all bodies; and when in sufficient quantity, it puts all their parts into motion, attenuates, decomposes, and dissolves those that are solid, rarefies those that are fluid, and thus adapts them to an infinity of motions. Is it not evident, that on these various operations of the sun on bodies all the phenomena and all the revolutions of the globe depend, even in the smallest circumstances? When the strength of the sun's light increases, i. e., when his rays fall less obliquely on us, and in a greater quantity on a given space, and that they continue longer each day, as is the case in summer; all this must necessarily produce the most considerable changes, not only in the atmosphere, but also on the

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body: heat supposes an accumulation of this principle, in an unnatural degree. Warmth is the medium between the two extremes.

**WATER.**—This is a compound, not a simple elementary body. It is composed of two gases, oxygen and hydrogen: in 100 parts of water there are 88 parts, by weight, of oxygen, and 12 of hydrogen. But by measure it is constituted of 2 parts of hydrogen and 1 of oxygen. Therefore, says Parks, if water be considered to be formed of an atom of oxygen and an atom of hydrogen, the size of the atom of hydrogen must be to that of the oxygen as 2 to 1, though its weight, when compared with the atom of oxygen, be as 1 to  $7\frac{1}{2}$ .

Water is found in four different states: solid, or ice; liquid, or water; vapour, or steam; and in a state of composition with other bodies: in this state it enters into the composition of some of the most precious gems.

Water may be decomposed by the galvanic apparatus, and the whole converted into two dry airs or gases; pass the electric spark through these, and they will in an instant be re-converted into water.—A. C.

surface of the earth. And when the rays fall more obliquely on a given space, and are consequently weaker, and in less quantity, and, the days being shorter, their action is not prolonged, as is the case in winter; what a change takes place in the earth, and what different phenomena do we observe in the atmosphere! What gradual changes do we perceive, when, from the remote sign of Capricorn, the sun continues to approach the equinoctial line, till in spring the days and nights become equal. And how many new phenomena appear, when this luminous and active globe returns in summer from the tropic of Cancer towards the line, till the days and nights become again equal in autumn, and the sun removes from our zenith.

• It is on the distance of this luminary that all the variations depend which we observe in the vegetation of plants, in the internal constitution of bodies in all climates and in all seasons. Hence each climate and each season has plants and animals peculiar to itself; hence the progress of vegetation is more or less rapid, and the productions of nature subsist a longer or shorter space of time. But it would be impossible to describe the various effects of the sun on the earth. All the changes and revolutions which take place on our globe have their principle in the influence of the sun; for on him principally the different degrees of heat and cold depend; I say principally, for the nature of the soil, the different combinations which exist in one country more than in another, mountains of a greater or less height, and their different position, may also contribute something towards a country's being more or less cold, and more or less subject to rain, to wind, and to the other variations of the atmosphere. But it is incontestable, that these accessory causes are not sufficient to produce the effects which we observe in different places and in different times; for these effects could not exist if the heat of the sun did not act in the manner it does. And were the degrees and manner of its operation changed, the effects also would change in the same proportion.

It requires but very little attention to be convinced of the numerous and sensible effects of which the sun is the prime cause; his influence appears daily. Some-

times he rarefies, and sometimes condenses the air ; sometimes he raises vapours and fogs, and sometimes condenses them, in order to form them into meteors, or send them down in rain. It is the sun which causes the sap to ascend in vegetables, which causes the leaves and blossoms to shoot, which produces tinges, and ripens the fruit. The sun animates all nature. It is the source of that vivifying warmth, which gives to organized bodies the power of unfolding themselves, and of growing to perfection. It penetrates into the depths of the earth, where it is supposed to assist in the aggregation of metallic particles, and gives life to animals. It penetrates mountains and rocks, and its influence reaches even to the depths of the sea. This alone must be sufficient to convince us of the power of our Creator. But if we consider with how much art God has drawn a multitude of great effects out of one and the same instrument, and has caused the heat of the sun to produce so many phenomena in nature, we shall be more and more sensibly persuaded that nothing less than infinite wisdom, joined to unlimited power, could have produced so many miracles. Would men deserve to be enlightened, warmed, and cheered by the sun, if in the salutary influences of this beneficent globe they did not acknowledge the glorious perfections of the Supreme Being ; if they did not admire his greatness and goodness ; and if they did not adore him with sentiments of the most profound veneration and respect ?

## DECEMBER XVIII.

### TEMPESTUOUS WINTER RAINS.

How different are these cold rains, which fall at present, from the warm showers which in summer embellished and fertilized the earth ! This change gives a melancholy aspect to nature. The sun is veiled, and the whole sky appears to be but one immense cloud. We cannot see to any great distance ; a gloomy obscurity surrounds us ; and the tempest is continually lowering. At last the clouds empty themselves and deluge the

fields; the atmosphere seems an inexhaustible reservoir of water; rivers and brooks are swelled up, overflow their banks, and lay fields and meadows under water.

However disagreeable and inconvenient this weather may appear to us, we must acknowledge it is for wise and kind purposes. The earth, in a manner exhausted by its fruitfulness, requires a renovation of its strength; and in order to this, it is not only necessary that it should rest, but that it should be also sufficiently moistened. The rain waters and revives the dry, thirsty land. The wet soaks into it, and reaches down to the lowest roots of plants. The dry leaves, which covered the earth, rot, and become excellent manure. The heavy winter rains fill the rivers anew, and furnish water for springs and fountains. Nature is never idle. It continues to labour, though its activity is sometimes concealed. The clouds, by continually pouring down rain or snow, prepare for the fertility of the coming year, and for the riches of summer. And when the heat of the sun restores the dry season, the abundant springs which the winter rains had formed diffuse their waters abroad, refresh the fields and vallies, and adorn them with fresh verdure. Thus the wise Creator prepares for the future; and that which appears to us inconvenient, and even destructive, is in his hand the germ of the beauties and abundance which are lavished on us in spring and summer. The blessings which God grants us by these means are as innumerable as the drops which fall from the clouds; and though blind and ungrateful man continue to murmur, when he should rejoice and adore, yet the eternal and unchangeable wisdom continues to fulfil its beneficent designs. Our preservation is, therefore, the chief end which God proposes in watering the earth with these rains. But the divine wisdom knows how to combine various designs subordinate to each other; and from the happy combination of these designs, the order and good of the universe result. Thus, animals which exist, not only for the use of man, but for themselves, must also be fed and supported; for them, as well as for us, the rains descend from the clouds, and render the earth fruitful.

But here, as in all other things, we see the wisest economy. All the vapours and exhalations which daily

arise from terrestrial bodies, are collected and suspended in the atmosphere ; which in due time restores them to the earth, either in the form of small drops, of heavy showers, or in flakes of snow, according to its different necessities ; but this is always done with economy, and without suffering liberality to degenerate into prodigality. Everything becomes serviceable ; dews, which are always imperceptible to us, light fogs, and mists, all contribute to fertilize the earth. But in vain would the vapours arise, in vain would the clouds be formed, if nature had not provided the winds to shake and disperse them on all hands ; to convey them from one place to another, to water the ground where it requires it. Were not this the case, some districts would be deluged with perpetual rains, and others would experience all the horrors of drought ; trees, plants, grass, and corn must perish, if the winds did not drive away the clouds, and mark out the places on which they were to pour out their rains. God says to the snow, Be thou upon the earth, and it descends in flakes ; and when he commands the winter's rain to fall, it spreads itself over the face of the field.

However inconvenient the rains of winter may appear, or the uncomfortable temperature of this season, they are nevertheless absolutely indispensable ; so also are the dark and gloomy days of our lives. In order that we may bring forth all the fruit of good works, it is not necessary that the sun of prosperity should shine uninterruptedly upon us. We must meet with trials and afflictions. Let us receive adversity from the hand of God with resignation ; as we may be fully convinced, that all his dispensations are ordered by infinite wisdom and goodness.

## DECEMBER XIX.

### JUDICIAL ASTROLOGY.

THE prodigious distance of the heavenly bodies from our globe, and the little connexion they have with it, will not permit us to believe that they can have any sensible influence upon it. Nevertheless, many super-

stitious people give credit to such influences, and say that continual emanations proceed from the stars and planets, which operate, not only on the atmosphere, but on all terrestrial bodies. But what are these emanations? If by these they mean the proper light of the stars, or the light of the sun reflected from the planets, it comes evidently to very little, as it is much less than what comes to us from the moon alone. But as the light of the moon has no manner of influence upon the earth or the atmosphere, consequently the much feebler light of the planets and stars can have none. But if it be supposed that other matter emanates from the stars, this supposition is not only void of all foundation, but is evidently false; for if there were real emanations, they must, when collected in the focus of a burning-glass, produce some alteration, and some sensible change in terrestrial bodies; but this is contradicted by experience. It therefore follows, that no other matter proceeds from these heavenly bodies than that faint light which they send to us; or if any other emanations proceed from them, they must be such as pass through terrestrial bodies, without producing the smallest derangement in their parts. Thus the astrologers, whether they deceive themselves, or wish to impose upon others, deserve nothing but contempt, when they inform us of the benign influence of Jupiter, the malignant influence of Saturn, the wit-inspiring influence of Mercury, the warlike disposition produced by Mars, and the amorous influence of Venus.

The planets not only cannot produce any of those particular effects, which the astrologers attribute to them, but taken even collectively they have no influence. But what shall we say of the rain-bringing Pleiades, the tempestuous Orion, the melancholy Hyades, the setting of Arcturus, and the rising of Capricorn, all of which presage hail and tempests? What influence can the constellation Taurus have on pease, beans, and such like; or the star Sirius on mad-dogs? What relation can Scorpio have with the productions of harvest? But if the rising and setting of the different constellations were observed only in order to know the proper times for the different operations of agriculture, and not as the causes of natural



things, this might be pardoned. In ancient times, the beginning, middle, and end of each season were not marked by months, but by the rising and setting of stars, in conjunction with the sun ; or by immersion in and emersion from the rays of that luminary. Hence the vulgar opinion, that the different aspects of these stars produce the effects which, in reality, can only be attributed to the seasons, and consequently to the sun. Orion rises in autumn, and sets in winter ; this has made some people think that he is the author of tempests ; but it is not he who raises them, it is the autumn and winter ; and his rising and setting only mark the time of those seasons. When the dog-star rises with our sun, it is excessively hot in our zone ; but this star is not the cause of it, the heat comes from our sun, who is then in his greatest elevation. I say our sun, for in the opposite zone, when the dog-star rises with the sun, it is so very cold as to benumb animals, and cover the rivers with ice. Therefore, the inhabitants of the southern countries, far from considering the dog-star as the cause of heat, consider it as the cause of cold. It is exactly the same with the Pleiades, which are supposed to be the cause of rain ; and it is the same with all the other constellations, to which effects have been attributed, which, in reality, belong to the seasons, when these stars rise and set.

If, then, the planets and fixed stars have no part in the temperature and natural revolutions of our globe, they can have no influence over human actions. The happiness and misery of individuals, and of whole nations, depend partly on their natural talents and passions, and partly on the political constitution of those states, and partly on the union of certain circumstances, natural and moral ; but in all these the stars have no influence ; and had they any we should be led to doubt the empire of providence, and to believe that the world was not governed by an infinitely wise, just, good, and powerful Being. And who would wish to inhabit a globe, the revolutions of which depended on blind chance, or the influence of the stars, which must be fatal to our natural and moral state ?

Let us, therefore, leave to the superstitious a science inimical to our repose, and so degrading to the human

mind; and let us ever understand astrology to be only at the bottom a miserable perversion of astronomy. It is a sufficient foundation for our peace, that we live under the empire of a wise, just, and gracious Parent, who is the sole arbiter of our lot, who directs all the events of our life; and who is the Governor, Preserver, and regulator of the sun, the moon, the planets, and the stars!

## DECEMBER XX.

## THE POLAR STAR.

AMONG the northern constellations there is none so remarkable as that which is nearest to the pole, and which is termed the Little Bear. The last star of its tail is less than two degrees distant from the pole; on this account it is called the polar star. It is easy to distinguish this from the stars near it, because it scarcely appears to change its position; and is always seen in the same point of the heavens. It appears, indeed, to revolve round the pole; but its motion is so slow, and the circle which it describes so small, that it is scarcely perceptible. Its situation, therefore, can be very little varied; and as it is seen in all seasons of the year, in the same point of the firmament, it becomes a sure guide to the mariner, particularly in the open seas. Before the discovery of the magnet, sailors had no surer guide than the polar star; and even now, when the sky is serene, they may depend more confidently on this star than on the magnetic needle.

The advantages which we derive from the polar star may naturally lead us to useful reflections. What a sure moral guide is that inestimable gift of God, viz., his WORD; and especially his GOSPEL, which shows us the course we should steer through the stormy sea of this world, and through the darkness with which we are encompassed! Without this faithful guide we should wander continually, and never find the path which leads to God and heavenly glory. If this divine word were

not as a lamp to go before us, and a light which points out the path we should take, we should be liable to err here below ; sometimes tormented with fear, at other times entertaining some feeble hope, but always in doubt and uncertainty. It is in divine Revelation alone that we find a sure and invariable rule, according to which we may pursue the race that is set before us with courage, and finish it with joy. Let us ever follow this sure guide, which cannot lead us astray. Let us attend to it as the pilot attends to the pole star ; and let us keep it continually in sight, that we may not err. With its assistance, we shall shun all dangers, be preserved from shipwreck, and at last arrive in that blessed haven where we shall rest from our labours ; and where we shall enjoy a happiness which nothing can disturb.

What we have said concerning the polar star should lead us to admire the goodness of God, who, by the situation and course of the stars, gives us a sure knowledge of times, places, and the different points of the heavens. An astronomer, though in an unknown country, can, by means of the stars, tell where he is, and know the month, day, and hour, as exactly as if he consulted the most correct time-piece. If, for instance, we only take notice that the stars come every day four minutes sooner to the place where they were the preceding evening, we know, consequently, that this will amount to two hours in a month. Thus, the star which we noticed this evening in a certain point of the heavens at ten o'clock, we shall see, if we are on the same spot, the twentieth of January, in the same point of the heavens, precisely at eight o'clock. The star which we observe this day at midnight exactly over our heads, will, in the space of a year, come to the same point again. In this we may see the tender concern of God for all the inhabitants of the earth. How much to be pitied would many people be, who have neither clocks, watches, nor geographical charts, if they could not supply this defect by the observation of the stars ! If we consider ourselves in the place of those people, this meditation will not appear a matter of indifference ; for we must be devoid of every humane and generous sentiment if objects

which do not immediately concern ourselves, but which interest so many of our brethren, should appear unworthy of our attention.

Let us raise our souls in gratitude to our compassionate Father, the Creator of all the heavenly host. The use that the stars are of in this respect to man is certainly one of the smallest advantages which result from the existence of these celestial bodies ; and yet this benefit alone merits our praise and thanksgiving. "The heavens are the work of thy hand ; thou hast marshalled all their hosts. Thou hast extended them widely as a curtain, and made them the ceiling of thy palace. The highest heaven is thy throne, and thou hast hung out the moon and stars to illuminate our nights."

## DECEMBER XXI.

### EFFECTS OF AIR WHEN CONFINED IN BODIES.

THE effects of air, when inclosed in bodies, are very astonishing. Every body knows what is the consequence of fluids freezing. Water in this state generally breaks the vessels in which it was inclosed. A musket filled with water, if the muzzle be hermetically sealed, bursts with great violence in excessive cold. This, at first view, appears incomprehensible ; we know that water is not fluid of itself, but becomes so by means of the principle of heat, which penetrates every part ; and that, consequently, it becomes a solid mass when it is deprived of the particles of this matter which were included in it, or when its fluidity ceases through excessive cold. It seems then that the particles of water must be condensed, and approach each other more closely ; and that thus frozen bodies should occupy less space than they did before. Yet they certainly expand while in a freezing state, and their size is considerably increased ; without which it would be impossible for vessels containing frozen fluids to burst. Besides, how could ice swim if it did not increase in bulk, and were not consequently lighter than water ?

But what can be the cause of this effect? The internal air; for it is impossible that it could be produced by any external cause. It cannot be the cold, for this is no real being nor positive quality, and, properly speaking, cannot penetrate bodies; and it is as certain that heat is not the cause of this phenomenon. The air cannot insinuate itself into vessels of metal or glass, sealed hermetically; and yet ice forms within them. We must therefore seek the cause in that internal air contained in the water. To be convinced of this, we have only to observe the water as soon as it begins to freeze. Scarcely is the first pellicle of ice formed on it, before the water begins to be agitated, and a number of air bubbles ascend. Often this upper coat of ice rises in the middle and splits, and the water springs up through the cleft, dashes against the sides of the vessels, and in running down freezes. Hence it is, that towards the middle of the surface the water appears elevated and convex. All this is the effect of the internal air; an effect that could not take place, or would at least appear in a much less degree, if the air were exhausted as much as possible from the water before it began to freeze.

On this ground, it is easy to explain a number of very singular phenomena. An intense cold is very injurious to vegetables. We know that the sap circulates in all plants, which, though it thickens a little in autumn and winter, nevertheless continues fluid. Intense cold converts this fluid into ice, and consequently enlarges its mass; and this cannot take place without causing many of the fibres and tubes to burst. Now, when this takes place, it is manifest that when the sap becomes rarefied in spring, it cannot circulate properly; just as the circulation of the blood must be stopped in an animal whose veins are cut. Thus, the growth of the plant is not only injured, but it dies, because the nutritive juice no longer circulates in its vessels. Let us consider, however, that this very cold, which is so prejudicial to the plants, is useful to the earth. A field tilled before winter is better fitted to receive the autumnal rains, which penetrate deeply into it. Frost succeeds; the earthy particles become dilated, and separate from each other;

and the thaw in spring completes the softening of the earth, rendering it light, moveable, and better adapted to receive the genial influences of the sun in fine weather.

Enough has been said to convince us of the power of the air; and of that expansive force which is productive of so many advantages to our globe. The property this element has of condensing and rarefying so wonderfully, is the cause of the greatest revolutions in the world. It is but in very few cases that the power of this fluid can become injurious; and even then the evil that it does is compensated with vastly superior advantages. But we must acknowledge that in this, as well as in a multitude of other phenomena of nature, there are many things which we cannot satisfactorily explain. What we know of the nature, properties, and effects of air, depends much on probable conjectures, which may be illustrated and verified in future times. Probably, those who may immediately follow us will discover that on many points we have formed false and precipitate judgments. How careful should we therefore be, that when we contemplate the works of God in nature, we should do it in a spirit of humility and self-diffidence; always remembering the weakness of the human understanding, and the uncertainty of our opinions and systems. Presumption is inexcusable in every science; but it is absolutely foolish and ridiculous when the knowledge of nature is in question.

## DECEMBER XXII.

### MUSIC.

ONE of the most pure and innocent pleasures which we can enjoy, we owe to music. It possesses the power of charming our ears, soothing our passions, affecting our hearts, and influencing our propensities. How often has music dissipated our gloom, quickened the vital spirits, and ennobled our sentiments! An art so pleasing and useful well deserves our attention; and calls upon us to employ it to the glory of our beneficent Creator.

But whence is the impression which music makes on

our ears? It is an effect of the air, which receives an undulatory motion, and which strikes our auditory nerves in a variety of ways. When a tight cord is struck, its figure is changed; for its elasticity not only causes it to go back to its first situation, but to extend beyond it; and thus it continues to vibrate backward and forward, till at last it settles into that state of rest from which it was drawn. These vibrations of the string are communicated to the air; which in its turn communicates them to other contiguous bodies. Hence it is, that when an organ is played on, the strings of a lute, if near, will be put in motion, and emit sounds. But whence is the difference of sounds; and how is it that they are either sharp or flat? This cannot be attributed to the quickness of the vibrations by which the sound is propagated in the air, for a sharp note cannot communicate itself with more velocity than a flat one; nor can it be owing to the quantity of air that is put in motion; for a sound may be either flat or sharp, and strong or weak, at the same time. The difference must be from the quickness of the air's tremulous motion. A sonorous body emits a sharp tone, when the vibrations of its parts are very quick; and a flat tone when these vibrations are slow. But how is it that certain united sounds are harmonious, and charm the ear; while others are discordant, and put us to pain? All that we can say in reply, respecting the physical characteristic of concords, is, that they are produced in the same key; whereas in discords, though the sounds may be emitted at the same time, yet they do not properly unite, and blend together; which, occasioning a double stroke on the auditory nerve, affects the mind in an unpleasing manner.

But of what use would harmony be if we could not distinguish it from discord? Let us praise God, who has so disposed the organs of hearing that we can receive and distinguish different impressions of sound, and has given our souls the faculty of uniting certain ideas to certain corporeal sensations. How much gratitude do we owe to our God for the many pure and innocent pleasures which he has given us to enjoy! In this point, let us testify our gratitude by using music to the glory of his name. Let us lift up our hearts to our great

Benefactor in the most melodious sounds, and celebrate his infinite goodness towards us !

## DECEMBER XXIII.

### MEN COMPARED WITH OTHER ANIMALS.

IN the comparison which we are going to make between men and other animals, there will be found some things which are common to both ; others, in which they have the advantage over us ; and, lastly, some in which we have the advantage over them.

The principal resemblance between men and brutes is, that both are material. We have, like them, life and organized bodies, which are produced by generation and birth, and supported by food. Both have animal spirits, and strength to fulfil the different functions assigned them. Both have voluntary motion, the free use of their various members, organs of sense, feeling, imagination, and memory. By means of the senses, both can feel pleasure and pain ; desire some things, and be averse from others. Both feel a natural propensity to self-preservation, and the propagation of their species. Both are liable to those general corporeal accidents which the connexion and different relation of things, the laws of motion, and the structure and organization of their bodies may occasion.

Relative to that pleasure which may result from the gratification of the senses, animals have many advantages over men. A principal one is, that they do not need so much clothing, instruments of defence, and conveniences, as men ; and are not obliged to invent, learn, and exercise the arts necessary to procure them.

At their birth, they bring into the world clothes, arms, and other necessary things ; or, if anything should be wanting, they have only to follow their natural instinct, which is sufficient to render them happy. That instinct never misleads them ; and whenever their appetites are gratified, they are perfectly content ; they desire nothing farther, and never run into excess. They are satisfied with the present, and take no trouble concerning the



future ; for there is much reason to believe that animals have not the faculty of representing to themselves what may happen. A present sensation informs them of their wants, and their instinct teaches them how to supply them. These means they use with pleasure ; they procure them what they wish, and they enjoy what they get with satisfaction. They never think of the morrow ; they know nothing of inquietude concerning the future ; even death itself surprises them, without having been foreseen, and without having been the cause of previous affliction to them.

In all these respects the brute has the advantage over the man. Man is obliged to meditate, invent, labour, exercise himself, and receive instructions, without which he must remain in a continual state of childhood ; and could scarcely procure himself the necessaries of life. His instincts and passions are not sure guides ; on the contrary, if he abandon himself to their direction, he is sure to be miserable. Reason alone makes the essential difference between him and the brute ; supplies what is wanting ; and in other respects gives him prerogatives to which the brute creation can never attain. By means of this faculty, he not only acquires necessaries, conveniences, and superfluities, but he can multiply the pleasures of sense, can ennoble and render them still the more gratifying, as he knows how to govern his desires by this faculty. His soul tastes pleasures which are entirely unknown to brutes ; pleasures which spring from science, wisdom, order, religion, and virtue : and these pleasures infinitely surpass all those which come through the organs of sense ; for, first, far from being contrary to the true perfection of man, they continually increase it. Secondly, they never forsake him ; even when his senses are deadened by sickness, old age, or any other circumstance, and are become insensible to all animal gratifications. Thirdly, they cause him more and more to resemble God ; while, on the contrary, the more he gives himself up to the pleasures of sense, the more he is degraded, and the more he resembles the brute. We may add, that the brutes are confined within a narrow sphere ; that their desires and propensities are but few, and consequently their pleasures are not greatly

diversified ; whereas man has an infinity of desires ; can press everything into his service ; and knows how to make every article useful in one way or other. He can continually add to the perfection of his nature by new discoveries ; he acquires farther degrees of knowledge ; and can make unlimited progress in the path of perfection and happiness. But the beasts are constantly confined within a narrow compass ; neither invent nor perfect anything ; continue always at the same point ; and never rise by application and exercise above animals of the same species.

We may conclude, that it is reason alone, and its consequences, which give us the superiority over the brute creation ; and in this the chief excellence of human nature consists. To use our reason, to ennoble the pleasures of sense, to relish intellectual delights, to grow continually in wisdom and holiness ; these distinguish man from the brutes ; this is the point to which he should ever direct his attention ; this is the end for which his Maker formed him. Let it be our grand business, our constant study, to answer this end ; for happy we cannot be, but in proportion as we seek what reason and revelation proclaim to be useful and good.

## DECEMBER XXIV.

### A CALCULATION CONCERNING THE RESURRECTION.

WITH what a crowd of human creatures must a single city be filled, on the great day of resurrection ! What prodigious multitudes will be spread over the whole earth ! Prodigious, indeed, but not innumerable ; seeing each of the dead is known unto the Lord his Judge, and the name of each entered in the eternal register. None shall be lost ; for all must appear before the judgment-seat, and none can escape the notice of the all-seeing God.

Let us suppose that Germany began to be peopled about 500 years after the general deluge ; that is, about 3,650 years ago, and that from the foundation of the city of Hamburgh at the above time, to the general judg-

ment, supposing it were to take place in the present year, there have only 200 persons been buried annually, taking one year with another; the number of persons would amount to 730,000! If then a single city could produce so many at the day of judgment, how many must the whole German Empire produce! Admitting that Germany contains 24,000,000 of people, the city of Hamburg could be reckoned only the three thousandth part of the whole. If this be the case, we may suppose on the preceding calculation that Germany will then produce 2,190,000,000! This is a prodigious number undoubtedly; and yet what is it in comparison of the produce of the whole earth, the present number of whose inhabitants has been estimated at 1,000,000,000! If we fix on this number, and apply the same calculation as before, the total of those who have died since the above-mentioned time, must amount to 912,500,000! If we now add those who lived before the general deluge, and those who died during the 500 years next following, which we may estimate at one fourth of the preceding, we shall then have a sum total of 1,740,625,000,000! Lastly, add all those who shall be found alive at the day of judgment, and let us fix the number at no more than 1,000,000,000, and the whole amount will be 1,741,625,000,000!

Let us give full scope to our imaginations, and figure to ourselves, as far as possible, that this prodigious multitude shall appear, in the last day, before the Judge of the universe; how great must that intelligence be that can scrutinize the most secret thoughts of all the individuals of which this vast multitude is composed; who knows exactly all their words, thoughts, and actions; who perfectly remembers the day of their birth, the duration of their life upon earth, with the time, manner, and circumstances of their death; who shall be able perfectly to distinguish the scattered atoms of each; separate, collect them, whether their bodies had been reduced to ashes, dissolved into millions of particles, or had undergone innumerable transmutations! What a work of Omnipotence, to collect these scattered atoms, to purify, ennoble, and form them into immortal bodies!

God has informed us, by divine revelation, that hosts

of angels shall gather his chosen from the four winds ; that the first sound of the trumpet shall awake the bodies of saints that slept, for those who died in Christ shall rise first. 1 Cor. xv. 23. What a pleasing employment to the ten thousand times ten thousand thousand angels, Ps. lxxviii. 17, to collect their well-beloved brethren, and present them to Christ ! And what transporting joy must it be for the myriads of blessed spirits, whom God hath gathered into his bosom, to find again those bodies which they had left behind, pale, ghastly, disfigured by sufferings, mutilated by acts of violence, or consumed by fire—to find them again, I say, clothed with celestial beauty and splendour, like those of the holy angels ; as light, as strong, and as radiant ! Such bodies shall never more be, as they were formerly, hinderances to the spirit ; but shall be in every respect adapted to the employments of a state of eternal beatitude. With what transport may we figure to ourselves the surprise and ineffable sensations of the elect, at the sight of this miraculous change !

## DECEMBER XXV

### REFLECTIONS ON THE NATIVITY OF CHRIST.

WHAT sentiments of joy, gratitude, and love should the Christian feel, who on this day celebrates the nativity of Christ ! But how great should our surprise be, when we reflect on the circumstances which accompanied this great event ! We see the Son of Man in the lowest state of humiliation ; and this Son of Man is our God ! We behold the strong God, the Invisible, by whose word the heavens and the earth were made, and by whose word they shall be destroyed ; and we see, at the same time, a visible being, weak, and clothed in flesh like our own ! How wonderful is this union ! The King of kings, whom the angels adore, appears in the form of a servant ! He is an infant, weak, destitute, shedding tears, and lying in a manger ! What an astonishing humiliation ! Human nature, so limited and corrupt, raised by Jesus Christ to an eternal throne of glory !

What an astonishing change ! But, can we at all comprehend the greatness of the divine mercy ? Or rather, should not the astonishment and admiration with which we are inspired when viewing it, be redoubled while reflecting on our unworthiness, and the infinite majesty of him who came to our relief ? This is a manifestation of love which infinitely surpasses all that we can merit ; a love, which exceeds all that we could either hope for or conceive ; a love, at the contemplation of which we can only admire, adore, and be silent.

But if our admiration be great, should not our hope be equally so ? In the Saviour incarnated, we see the glorious sign of the new covenant which God has made with man. In this we see how faithful God is to his promises, seeing he has given his Son for the life of the world. And should we not expect that whatever God has promised in his name shall be accomplished with the same fidelity ? Jesus Christ would never have honoured our nature so far, as to have united it so intimately to himself, had he not designed to pardon our iniquities, heal our infirmities, wash out our stains, and restore the nature of man to its original purity and innocence. What confidence should we therefore have in the love of our heavenly Father ! He has already given us proofs of an inconceivable love ; and will he not with Christ freely give us all things ? What can he refuse to grant to our earnest prayers, who has already given us his most precious gifts, without our having even requested them ? And may we not have the greatest confidence in him who became man for our sakes ? If God be in Christ, he will certainly accomplish all that he designed by coming into the world. He will put all our enemies under his feet ; he will blot out all our iniquities ; and his almighty hand will open the gates of heaven for our reception. If we consecrate our souls to him, he will snatch us from that abyss of vice in which we have been immersed, and give us power to overcome the world and sin ; we shall be made new creatures, holy and glorious like himself.

Can anything be more just and rational than our giving up ourselves on this solemn day to sentiments of gratitude and joy ? Can love be repaid but by love ? It

is true, that the love of God our Saviour towards us is inestimable, and that ours must ever be infinitely less than his ; but let us exert all the powers he has given, and love him with all that fervour with which his grace is ready to inspire us. This sincere love, though weak, will be pleasing in his sight. The love of Christ will induce us to seek in him our happiness and joy ; and the contemplation of his mercy will be our most delightful employ. We shall seek nothing with so much fervour as to keep up a holy communion with him by faith. Full of zeal for his glory, we shall avoid and abhor everything which might defile our souls, or render them displeasing to the Divine Redeemer. Let us dedicate our lives to him, and only expect a continuance of his favour while walking according to his holy precepts. Yes, blessed Redeemer, to thee alone should we consecrate our bodies and souls ; to thee we should sacrifice every wish ! At thy manger we should learn to renounce ourselves ; to abhor pride ; and to suffer, if necessary, for our neighbour's good, inconvenience, humiliation, and distress.

Such are the sentiments with which those who are called Christians ought to celebrate the nativity of Christ. Every joyous emotion should have its origin in the deepest conviction of the great truths of our religion. Let not our admiration be the fruit of ignorance, but of an enlightened conviction. To this end, let us deeply and seriously reflect on the wonders of divine grace ; if not to fathom their depths, yet to get a deeper knowledge of their nature and certainty. And if the greatness of the wisdom of God, and his immense love, astonish and confound us, let them also excite in our hearts a profound veneration for him who dwells in the heavens, and a humble opinion of our own weakness. Let us take heed that our hope be not the effect of a blind persuasion. If it be the offspring of unfeigned faith, what sweet consolation, what celestial joy, will it diffuse through our hearts ! Then, assisted by faith's victorious power, we shall surmount all the difficulties of life ; nothing shall be able to rob us of our joy ; nothing be able to destroy our felicity. Lastly, let not our love for Christ be ever separated from the most lively

gratitude; let us endeavour, incessantly endeavour, to offer the sacrifice of a pure heart and holy life to him who has done so much for us. "What can we render thee, O our great Benefactor, for so much love? Thou hast united us to God; thou hast purchased salvation and life! Lord, accept the homage of all we have, and all we are! Receive the sacrifice of our bodies and spirits, which both belong to thee!"

## DECEMBER XXVI.

### THE PLACE OF CHRIST'S NATIVITY.

At first sight, it seems of little consequence to know the place of Christ's nativity; for we should consider him as our Redeemer, whatever the circumstances might be which attended his mortal life. But, seeing it has pleased God to announce beforehand the place where the Saviour of the world should be born, it became necessary that it should happen precisely in that place; and that this should be one of the characteristics whereby Jesus Christ should be known to be the true Messiah.

It is also a matter of small importance to us where we may live, provided we find genuine happiness. There is no place on earth, however poor and despicable, but may have better and more happy inhabitants than many of those are who dwell in the largest and most celebrated cities. Do we know a single place on the whole globe where the works of God do not appear under a thousand different forms, and where a person may not feel that blessed satisfaction which arises from a holy and Christian life? For an individual, that place is preferable to all others where he can get and do most good. For a number of people, that place is best where they can find the greatest number of wise and pious men. Every nation declines in proportion as virtue and religion lose their influence on the minds of the inhabitants. The place where a young man first beheld the dawn, and the beauty of renewed nature, and with most lively sensations of joy and gratitude adored his God, with all the veneration and love his heart was ca-

pable of; the place where a virtuous couple first met and got acquainted; or where two friends gave each other the noblest proofs of their most tender affection; the village, where one may have himself given or seen the most remarkable example of goodness, uprightness, or patience;—such places, I say, must be dear to their hearts.

Bethlehem, according to this rule, was, notwithstanding its smallness, a most venerable place; seeing there so many pious people had their abode, and that acts of peculiar piety had often been performed in it. First, the patriarch Jacob stopped some time in it, to erect a monument to his well-beloved Rachel. It was at Bethlehem that honest Naomi, and her modest daughter-in-law Ruth, gave such proofs of their faith and holiness; and in it Boaz, the generous benefactor, had his abode and his possessions. At Bethlehem the humble Jesse sojourned, the happy father of so many sons; the youngest of whom rose from the pastoral life to the throne of Israel. It was in this country that David formed the resolution of building a house for the Lord, and in which he showed himself the true shepherd and father of his subjects, when at the sight of the destroying angel, whose sword spread consternation and death on all hands, he made intercession for his people. It was in Bethlehem that Zerubbabel the prince was born; this descendant of David, who was the type of that Ruler and Shepherd, under whose empire Israel is one day to assemble, in order to enjoy uninterrupted happiness. Lastly, in this city the Son of God appeared; who, by his birth, laid the foundation of that salvation, which, as Redeemer, he was to purchase by his death for the whole world. Thus, in places which from their smallness are entitled to little notice, men sometimes spring who become the benefactors of the human race. Often an inconsiderable village has given birth to a man, who by his wisdom, uprightness, or heroism, has been a blessing to whole kingdoms.

It is our business so to live in our cities or villages, that the end for which Jesus Christ was born may be accomplished in us. It is certain that genuine piety would make the most rapid progress in the earth, if,



everywhere, men endeavoured to give proofs of innocent manners and fervent faith; and become models of patience, diligence, and uprightness. If our cities furnished a greater number of virtuous examples, their influence would soon become extended to the inhabitants of the country; and in the smallest villages or hamlets we should see persons who, like Joseph and Mary, were distinguished by their piety, and would attract the respect of the wise and good, though living in the depth of poverty and abasement. God would shed his blessings over the country of these good people; and in some generations, might we not hope to see a people formed full of the fear of the Lord, and diligently walking in his ways?

He who has travelled most over the world, who has visited cities, the dwelling-places of kings; and who has been a witness of the various crimes committed there—has he not cause to be thankful to God, if at last he find a town or village, where, in a peaceful cot, encompassed with quiet neighbours, he may consecrate himself entirely to the service of God and the good of man, and thus arrive at that genuine happiness which flows from peace and serenity of soul? He will not then regret that he lives not in places more magnificent indeed, but where sensual pleasure spreads all its snares; more superb, but where vice has its throne; more rich, but where the inhabitants live in forgetfulness of God, and the duties they ought to perform. To these he will prefer an obscure retreat; where, sheltered from cutting remorse, he may spend his days in tranquillity and joy.

## DECEMBER XXVII.

### THE CARE WHICH GOD TAKES OF MEN FROM THEIR BIRTH.

WHAT a multitude of wants have we the moment we are born! It is with great agony, and through the assistance of others, that we are brought into the world; and we should have speedily lost the life we began to live,

had not a variety of things, relative to our clothing and nourishment, been provided beforehand, and had we not found persons who condescended to take care of us in that state of weakness in which we were totally destitute of all things; or rather, if our heavenly Father had not watched over our preservation. He took care of us when we were in our mother's womb, where no human wisdom or diligence could have provided for us. His hands formed, arranged, and connected all the members of our bodies. He pointed out to the veins the course they should run, and filled them with the vital fluid. "He has clothed us with skin and flesh, and fenced us with bones and sinews," Job x. 2. We were a shapeless mass; but the Almighty fashioned us, and, uniting a rational and intelligent spirit with our bodies, made a human creature worthy of himself, for he stamped it with his own image. The same kind providence, which presided over our formation, has never forgotten us, but continued to watch over us with paternal care. At our entrance into the world we were provided with tender and faithful friends, who received us with extraordinary affection, and who spared neither trouble nor expense to do us good. These faithful friends were our parents. What miserable creatures must we have been, had not our heavenly Father inspired them with such disinterested love for us! But could even this love have availed, had these parents been destitute of the means to assist us? The more they loved us, the more insupportable their indigence would have been, and the more miserable they must have felt, while destitute of the power to supply our wants. But God took care that they should have everything that was necessary for us precisely at the time in which it was needed.

But the tender care of the Lord extended far beyond the moment of our birth. He then laid the foundation of our future happiness. Poor and despicable creatures! we neither knew nor could know, at that time, what our lot should be. But all was perfectly known to him. He saw the whole of our life, with the future and contingent events which concerned it, together with all their consequences and references. He knew what would be most advantageous to us, regulated our lot ac-

cordingly, and determined at the same time on the means which he purposed to employ in order to procure us that felicity which his mercy designed. From our birth the causes existed which were to influence our future happiness, and began then to act conformably to the Divine views. How much did the happiness of our lives depend on our parents—their manner of thinking, their circumstances in life, their connexions, &c. ! How much did the education we received, the examples we had before us, the connexions we formed, the opportunities we had of exercising our powers and unfolding our talents, influence the happiness of our whole life !

And did not the wisdom and goodness of God our Father appoint, regulate, and conduct every advantageous circumstance ? We could not choose our own parents, nor appoint their situation in life. The choice of the masters and friends we had in our youth did not depend wholly on our parents ; and whatever their prudence and attention might have been, they themselves were dependant on circumstances and opportunities. It was God who managed all those conjunctions which have proved so advantageous to us. It was he who watched over our happiness, and who in his great goodness directed and controlled all events which might prove favourable or unfavourable to our well-being. He foresaw and determined everything ; and all his dispensations towards us were acts of wisdom and mercy. He knew what adversities would be useful to us, and appointed what their sources should be, when they should begin, when they should end, and the advantages we should derive from them. All these causes acted for some time in secret ; by degrees they were developed ; and in many instances we have already seen how necessary our losses and afflictions were to our welfare. But they could not have had these salutary effects without the concurrence of many causes which acted remotely a long time before, and were utterly unknown to us. In a word, the Divine goodness has wisely directed all the events of our life, so as to be most beneficial to us.

These reflections should fill our souls with confidence and tranquillity. What can be more consolatory than to

be persuaded that an invisible Being takes care of us ; a Being who is infinitely good, wise, and powerful ; who has watched over us from the moment of our birth ; and who from that hour determined and regulated everything necessary for us, during the course of our lives ; who has counted our days, and fixed the term of our life, so that no human power can change it ; and who, from the first moment of our existence, has provided everything necessary for our present and eternal happiness ? The confidence and peace which rest on this basis must be immoveable.

## DECEMBER XXVIII.

## THE TERM OF HUMAN LIFE.

EVERY man dies precisely at the time that God has appointed in his eternal wisdom. As the time of our birth is fixed, so also is the time of our death. But the term of our life is not subject to fatality, nor inevitable necessity ; such things have no existence. All that occurs may happen sooner or later, or not take place at all. And it is always possible that the man who died to-day might have died sooner, or might have lived a much longer time. God has not fixed man's days by an arbitrary or absolute decree, without taking in the circumstances in which he might be found. He is an infinitely wise Being, who never acts but from motives worthy of himself. He therefore must have just reasons to induce him to determine that such a man should leave the world at such a time rather than at another. But although the term of life be in itself neither influenced by necessity nor fatality, it is nevertheless certain, and can never be really changed.

When a man dies, there are always some causes which infallibly lead to his death ; but these may be always suspended or changed by the Supreme Being. One dies of a mortal disease ; another, by a sudden and unforeseen accident. One perishes by fire ; another, by water. God has foreseen all these causes ; nor is he an idle and indifferent spectator in the business ; he has examined

them all with care ; he has compared them with his own purposes, and sees whether he can approve them or not. If approved, they are consequently determined, and in that case there exists a divine decree, in virtue of which the man dies of such and such an accident, and in such a particular time. This decree can neither be revoked nor prevented ; for the same reasons which God has at present for removing a man from this world were known to him from all eternity ; and he formed the same judgment then of it which he does now. What, therefore, should induce him to alter his purpose ?

But it may so happen, that God, foreseeing the causes of the death of a particular person, did not approve of them. In this case he must, at least, have determined to permit them, without which they could not take place, nor could the man die. But if the permission of those causes of death were resolved on, God wills, therefore, that we should die in the time in which those causes shall exist. It is possible that he might have been inclined to grant us longer life, and did not approve the cause of our death ; but it was not consistent with his wisdom to counteract the operation of those causes. He views the universe collectively, and finds reasons to induce him to permit the death of a certain person at a particular time, although he approve not the causes, manner, and circumstances of that death. His wisdom finds means to direct that death to the most useful purposes ; or he foresaw that a longer life, in that person's circumstances, would neither be useful to himself nor to the world ; or, lastly, he saw that in order to prevent that death there must be a new and different combination of things—a combination which could not accord with the general plan of the universe, and which would have prevented a greater good from taking place. In a word, although God may sometimes disapprove the causes of a man's death, he has nevertheless wise and just reasons to permit them to take place ; and, consequently, to purpose that the man shall die at that time, and by those means.

These considerations are calculated to make us look on death with Christian fortitude. What renders death formidable is, chiefly, the uncertainty of the manner and

time of our leaving the world. If we knew, beforehand, when and what manner of death we should die, we should probably wait for it with more courage, and fear it less in its approaches. Now nothing can be more efficacious to calm and strengthen our mind than the persuasion that Divine Providence watches over our lives; and that, from the foundation of the world, he has determined, with infinite wisdom and goodness, the time, manner, and circumstances of our death. The term of our lives is therefore appointed, and no man can die sooner or later than God has determined, for the good even of the person himself; for each person dies precisely at the time in which it is most to his own advantage. An almighty Providence watches over our days; it lengthens or shortens them as it judges will be most profitable to the children of God, not only in reference to this world, but also in reference to eternity. Fully persuaded of this consolatory truth, we may wait for death with a tranquil mind; and seeing the hour is uncertain, let us be found constantly ready to meet it. It certainly will not appear till God judges it most expedient. It is true, we know not what kind of death we shall die, nor the circumstances of it; but it is sufficient to know that we cannot die but in that way in which the beneficent Governor of the world sees it will be best for ourselves, and for all those who appertain to us. Fortified by this thought, let us proceed without anxiety on our earthly pilgrimage; let us cheerfully submit to all the dispensations of Providence, and never fear any danger to which the performance of our duty may expose us.

## DECEMBER XXIX.

### THE INSTABILITY OF EARTHLY THINGS.

THERE is nothing in nature whose state and mode of being is not liable to change. Everything is the sport of frailty and inconstancy, and nothing is so durable as to continue always like itself. The most solid bodies are not so impenetrable, nor their parts so closely con-

nected, as to be exempt from dissolution and destruction. Every particle of matter changes its form insensibly. How many changes have our bodies undergone since they were formed in our mother's womb! We annually lose something of what we formerly were, and gain as many new particles from the animal, vegetable, or mineral kingdom. Everything on earth increases and decreases by turns; but with this difference, that these changes do not operate so speedily in some bodies as in others.

The celestial bodies appear now the same that they were from the beginning, and these are probably the most invariable of all bodies. Nevertheless, accurate observers have noticed that certain stars have disappeared; and the variableness of the spots on the sun's face prove, that even that luminary is in some respects subject to the general law of mutability. Besides, his motion renders him subject to several variations; and although he is never extinct, yet he has often been obscured by fogs, clouds, and perhaps by internal revolutions also. This is all that we can know, in the almost immeasurable distance we are from him. How many other changes, both external and internal, might present themselves to our eyes, were we near enough to that luminary, we cannot tell. If the instability of terrestrial things strike us more, this is because we are so nigh them. And how frail are they! And how subject to change! The object continues to resemble itself; and nevertheless it is different from what it once was. We daily see the things here below under new forms; some increase, others diminish and perish.

The year which will come to its close in about two days has furnished us with incontestable proofs of this. Even in the little circle in which we are confined, how many revolutions have taken place! Many of those whom we have known for many years are no more. Many whom we have known to be rich are now become poor, or at least reduced to straitened circumstances. And if we examine ourselves, shall we not find that in many respects we also have been changed. Have not our health and activity suffered considerable decrease? And do not all these alterations indicate that the great

and last revolution which death shall work in us is at hand? Besides, how many things happen in this and the two following days of this year! We may become poorer than we are, be attacked by sickness, experience the unfaithfulness of reputed friends, or even die in this short space of time; at least it is certain that circumstances may occur which it was impossible for us to foresee.

Reflections of this nature might well distress us, or even drive us to despair, if we could not derive support and consolation from religion. But this leads us to the only, invariable, and eternal Being, whose very nature is unchangeable. This immutable Being must be to eternity just what he is. Therefore his mercy endures for ever, and his righteousness from generation to generation. May this truth be ever present with us, that it may soften the disagreeable vicissitudes which we continually meet with here below! How happy will it be for us, if all these revolutions, which days, years, and times bring with them, lead us nearer to the Supreme Good, and to the state of everlasting glory and felicity! "Thus, full of confidence in his invariable goodness, we will submit with resignation to all the changes and chances of this mortal life; all our souls shall rejoice in him, who is the immutable Being, our Light, our Rock, and our sure Defence."

## DECEMBER XXX.

### HOW TIME IS GENERALLY EMPLOYED.

THE approaching close of the year should lead us to make some reflections, which, however important, do not always occupy us as they ought. In order to feel more sensibly how short the course of our life is, let us now examine how we have spent the days that are past, though we have much reason to believe this will be to us a subject of humiliation and confusion.

Let us first consider those days, to regulate the use of which was utterly out of our power. How many hours of this year have we employed in eating, drinking, and



sleeping; in a word, in caring for the body, and providing for its various necessities! How many hours more have been spent in almost useless occupations, or at least such as were of no use to our immortal souls; for instance, in unnecessary journies, in disagreeable company, and in long and fatiguing meals! How many hours have we spent in uncertainty, and consequently in inaction! How much time have we lost in examining intricate questions and embarrassed affairs, in weighing the *pros* and *cons* before we resolved to act in certain important matters! And how many hours have we lost in the expectation of particular advantages! Thus, in taking but even a superficial view of the use we have made of this year, we find that a multitude of days have been lost to that immortal spirit which inhabits this clay tenement; and after this deduction, how little remains of the year which we can say has been employed for real life! It is evident that out of 365 days there are scarcely fifty of which we can say, "These are ours; we have employed them in the great interests of our souls, and in the acquisition of eternal felicity." And of this small remaining number of days, how many hours have we lost by our folly or frailty! Alas! how much time has been sacrificed to vice, or tainted by sin! God of mercy! how humiliating is this thought! how proper to confound us! On this subject, nothing but the ever salutary doctrine of the merit of thy Son can calm our terror, or snatch us from eternal misery!

How many of those hours, which the paternal love of God gave us to be employed in our eternal interests, have been foolishly lavished away, and that with the blackest ingratitude! Precious hours! during which, alas, we have wandered far from this most compassionate and best of Parents! Can we not reckon many hours which we have sacrificed to the world, to vanity, to indolence, to false pleasures; which we have profaned by impurity, envy, jealousy, backbiting, and other vices, which betray a heart destitute of proper love and respect to God, and of charity to our neighbour? And have we never spent any of that time which we should have employed in advancing the kingdom of Christ, in opposition to the divine counsels, in disturbing the peace of society,

and distracting his church? And even, since God has brought us to a better mind, and inspired us with a desire to walk in his ways, how many days have we irrecoverably lost, which should have been employed in that religion which was our glory, and which pointed out the path that led to eternal happiness! How have we been injured by distractions, coldness, barrenness of souls, doubts, inquietudes, want of temper, and impurity of mind! These and many other infirmities, the consequences of improper conduct, the frailty of the body, the weakness of the mind, or the strength of old habits, have often disgraced those who have made some considerable progress in the ways of God. Now by all these things our piety is injured, the progress of our happiness retarded, and our graces greatly weakened or destroyed! Lastly, with what speed does the little portion of time which we can dispose of fly away! A year is gone, and we have scarcely perceived it! And of what importance is a year to a being whose real life may be reckoned by hours! We have scarcely thought seriously of it, till another year is slipped by. Had we employed this year in the work of our salvation, we should not desire to recall it either in whole or in part. But now that we find that so little of it has been spent in the great purposes for which it was given, we wish to recall that part at least of which we have made the worst use. But it is in vain; the year closes, and all the good and bad actions which have marked it are swallowed up in eternity!

Father of mercies, reconcile us to thyself by Christ Jesus; and grant that this mispent year may not become a subject of anguish to us on our death-bed, nor the cause of our perdition through eternity! Pardon, O pardon all sins, which we have this year unhappily committed against thee! And grant us mercy!—mercy, at the hour of death; mercy, in the day of judgment; and mercy through all eternity!

## DECEMBER XXXI.

A HYMN OF THANKSGIVING AT THE CLOSE OF THE  
YEAR.

LORD, thou art the God of time ; thou art also God of eternity ! I will sing a joyous hymn to thy praise ; I will celebrate thy holy name. A year is finishing its course. To what do I owe the continuation of my existence ? It is to thy grace alone, and to thy paternal bounty !

Being of beings, receive my adoration ! Everlasting Lord, thou canst not vary ; but as for us, poor and feeble mortals, we have been, are now, and shall be dust. Thou alone art incapable of change. Thou hast been, thou art, and thou shalt be to eternity !

Lord, thy faithfulness endures from generation to generation ; thy mercy is new every morning ; there is not a moment of my life in which thou hast not given me some new blessing.

Thou hast led me, by thy fatherly care, through the year which is now ending ; when my heart became a prey to anxiety and distress, thou didst pour out thy consolations, and didst haste to my succour. I will praise thee ! I will exalt thee, from the ground of my heart ! I will cast myself anew on thy unerring guidance and merciful support.

Pardon, O my God ! pardon the innumerable offences which I have committed against thee in the days that are past ! And let me once more, for the sake of Jesus, experience thy paternal support ! Teach me to do thy will ; teach me to please thee as long as I live !

Inspire me with new zeal, and grant me new strength to walk before thee in the paths of righteousness ! Make me attentive to thy voice in my conscience ! Quicken me, and sanctify my heart by thy Spirit ; that, being filled with love, and detached from the world, it may ever be united unto thee, O thou Sovereign Good !

The world and its enjoyments flee away ; in it, therefore, I should seek no happiness. Even here below, I

may aspire after pure joys. I am related to angels ; my patrimony is heaven ; grant, O God, that I may incessantly aspire after it !

O my God ! teach me to redeem the time, and to walk with holy circumspection in the way which leads to eternity ! Condescend to alleviate the burden of life, till I reach that happy period, in which I shall rest from my labours, and my repose be interrupted no more !  
**Amen.**

END OF REFLECTIONS.

LONDON :  
PRINTED BY J. HADDON CASTLE-STREET,  
FINSBURY.





